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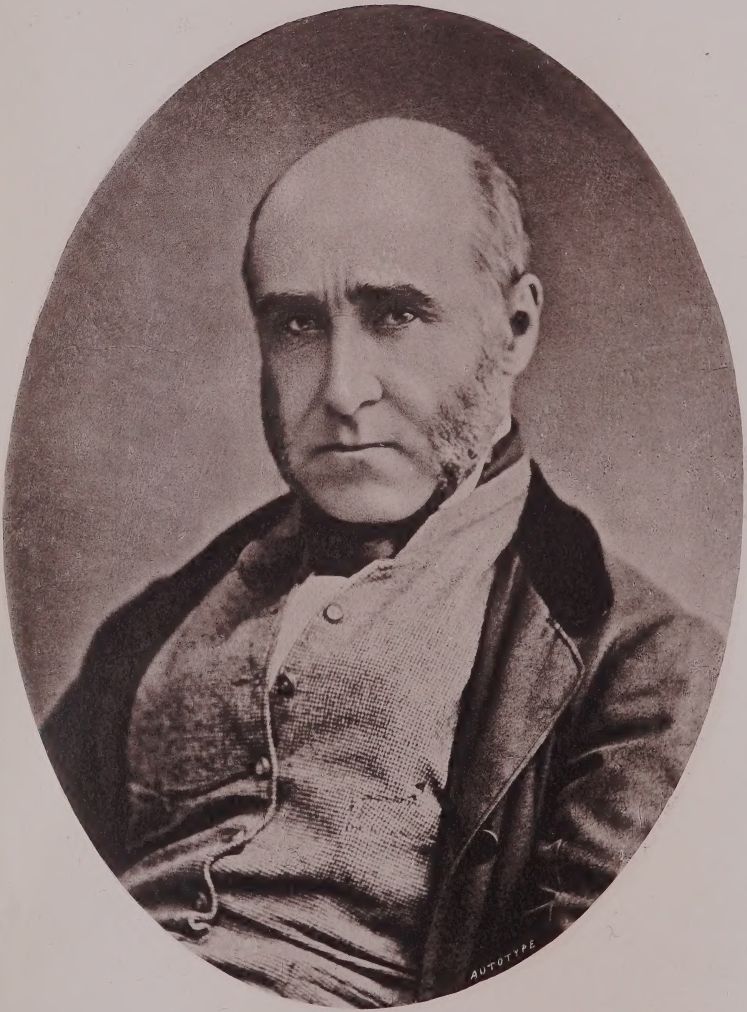

JOHN SIMON, C.B., F.R.S.

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PUBLIC HEALTH REPORTS.

By

JOHN SIMON, C.B., F.R.S., &c.

EDITED FOR

THE SANITARY INSTITUTE OF GREAT BRITAIN

BY

EDWARD SEATON, M.D. LOND., F.R.C.P.,
Lecturer on Public Health and Sanitary Science
at St. Thomas's Hospital.

VOL. II.

EXTRACTS FROM PRIVY COUNCIL REPORTS, 1858–1872.
LOCAL GOVERNMENT BOARD REPORTS, 1874–1876.
PRIVY COUNCIL REPORTS, 1874–1877.
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EXTRACTS FROM PRIVY COUNCIL REPORTS.

The First Report to the Privy Council, 1858.

[Extracts from this report (which related only to the last four months of 1858) have already appeared in the section, Vol. I., pp. 321–8, devoted to a description of the system of Public Vaccination in England. An account is also given in this first report of three important local inquiries in relation to matters concerning the public health in Conway, Wraysbury, and Windsor. The inquiry at Windsor was conducted by Mr. Austin, and it arose out of a complaint made by Sir James Clark, Physician to the Queen, that typhoid fever was prevailing epidemically there. A section of the report referred briefly to the then state of the public health in England.—Ed.]

From the Second Report to the Privy Council, 1859.

[Extracts from this report relating to Vaccination have appeared in Vol. I., pp. 328–44. This report also contains accounts of several important and interesting local inquiries, viz.: at Bridport, by the late Dr. Seaton, on account of small-pox; at Poulton-le-Sands, in Lancashire, by Dr. Burdon-Sanderson; and Kirkby Stephen, in Westmoreland, by Dr. Ord, both inquiries being on account of fever. An account is also given of proceedings in reference to the town of Sheerness, and of the inquiry held into the conditions of local government, together with the result of Mr. Austin's inquiry into the cause of the ague in Sheppey. Another part of the section of the report embracing local inquiries describes the proceedings taken in reference to the London Sewage Nuisance, Dr. Ord's report thereon forming part of the text. Two important sections of this report are given below. One of these appears under the general heading of "Distribution of Disease in England," &c., and it relates to Diarrhœal Districts. The other relates to Epidemics of Diphtheria.—Ed.]

DISTRIBUTION OF DISEASE IN ENGLAND, AND THE CIRCUMSTANCES BY WHICH IT IS REGULATED.

Diarrhœal Districts.

Diarrhœal Districts.

In a Report* submitted to the late General Board of Health on the eve of its dissolution, attention was drawn to the extreme inequality with which certain fatal diseases prevail in different parts of England. And it was pointed out that the diseases thus unequally prevailing are the diseases which most of all can be prevented. It was urged, as an almost inevitable conclusion from these facts, "that in certain districts of " England, sometimes by good fortune, sometimes by good " local government, definite causes of disease must have been " kept at or near their least conceivable activity; while in " other districts of England the same causes must have been " prevailing with as little check, as if the community had " been one of savages, to whom science had never taught her " first and simplest lessons." It was submitted that all such cases of high special death-rate, as had in the report been referred to, "ought to be thoroughly investigated; that the " local public, and the general public, and the Government, " and the Legislature, ought to have before them the precise " facts of each case where a preventable, or partly preventable, " disease prevails to great excess in any particular district." And, with reference to the means for attaining this end, it was observed—"The Public Health Bill, now before Parlia" ment, will, if it become law, provide for this object. Her " Majesty's Privy Council, empowered to 'cause to be made " such inquiries as they see fit in relation to any matters con" cerning the public health in any place or places,' will be " able to bring before local authorities, and the people under " their jurisdiction, facts in which the latter are so greatly " interested. The appointed officer will be able to state, not " only in such general terms as have here been employed, " but in terms distinctly applicable to each case investigated,

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* The above reprinted "Papers relating to the Sanitary State of the People " of England."—J.S.

Diarrhœa Districts.

" what local evils have to be removed in order to abate in " various districts the present tenfold or hundredfold multi- " plication of some preventable disease."

DIARRHŒA in its various forms was particularly referred to in the report. And it will be convenient for the present purpose to note the terms in which that reference was made.—[See above, Vol. I., pp. 436–442, from which here only a few sentences need be repeated.—ED.] " *Cholera, diarrhœa,* and " *dysentery* have, during the nine years 1848–56, been fatal " to 237,498 persons. If this number of deaths had been " equally divided, the annual number would have been " 26,388; but the distribution has been unequal. In the " two years 1849 and 1854 there were 116,246 deaths; in " the two years 1850 and 1855 there were but 29,425, or " little more than a fourth part of the former amount. This " inequality depends on the present tendency of diarrhœal " diseases to prevail in certain years epidemically. A large " proportion of the excess of deaths in 1849 and 1854 " occurred during a few summer weeks, when the epidemic " influence was at its height, and when it occasioned in " various parts of the country a very alarming mortality. . . . . " Dr. Greenhow's paper shows that these diseases have pre- " vailed in different parts of the country with an astounding " inequality. The average annual death-rate by cholera has " ranged, from nothing and nearly nothing in some districts, to " 357 and 365 and 403 in others. . . . . But cholera has not " been alone in showing this great range. Local differences " of death-rate scarcely less wide have been shown by those " diarrhœal diseases which are always present among the " population. Ordinary diarrhœa and dysentery have ranged " in their joint average annual death-rate from under 10 in " several districts, to 303 and 305 and 345 in others. Or " if all diarrhœal diseases, epidemic and non-epidemic, be " taken together (as Dr. Greenhow has taken them) under the " single heading of *alvine flux* the average annual death-rate " by this class of disease has ranged in different districts, " from 4, 8, 10, 14, and 17 in some, to 463, 493, 510, 568, " and 663 in others. . . . . If the diarrhœal death-rate of " England generally were even *only ten times* the minimum

Diarrhœal Districts.

" diarrhœal death-rate, there would be an annual saving in " England of nearly 20,000 lives.* .... A certain quantity " of diarrhœa depends, no doubt, on other causes than " putrefactive pollution of the system. *Phthisis* not rarely " proves fatal by its effects on the intestinal canal; and " probably a few of these deaths are registered under the " name of the secondary disease. *Temporary faults of* " *diet* very often occasion diarrhœa, though not often " fatal diarrhœa. *Habitually improper food* (especially " as regards infants and very young children) and various " other influences contribute to the total of diarrhœal deaths. " But these various causes [so far as they are of personal " origin] operate evenly, or almost evenly, throughout the " country." And where any of them becomes of local importance,—as, where, for instance, in certain manufacturing towns, the constant engagement of mothers away from home in various branches of industry occasions on a great scale the improper feeding of infants and a consequent excess of fatal infantile diarrhœa, this influence, like that of the filthinesses first spoken of, is (the report went on to argue) of an unnatural and removable kind, of a kind against which local arrangements ought directly or indirectly to provide.

On all these grounds it seemed urgent that scientific inquiry should be made into the causes of the disproportionate localisation of diarrhœa in particular districts of England. And if the Privy Council, with respect to initiative action in matters of this kind, had to take for its principle, that it would without solicitation institute local inquiries in cases of excessive preventable mortality, the case of EXCESSIVE DIARRHŒAL MORTALITY seemed particularly fit for a beginning;

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* A less arbitrary and yet a stricter standard of comparison was furnished by Dr. Greenhow, in a paper published by the Statistical Society in their Journal of June 1859. In two considerable groups of contiguous registration-districts—one in the north with an aggregate population of 56,637, the other in the south with an aggregate population of 183,154, he found the average diarrhœal death-rate to be only 29. If this partial rate were to become general in England (and the districts in which it prevails are by no means so faultless as to be unapproachable) there would occur annually in England about 3 diarrhœal deaths where now there occur about 17; and the annual saving of life would be greater than is spoken of in the text.—J.S.

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not only because its causes are for the most part grossly demonstrable; not only because of the popular terror which reigns during its epidemic prevalence as cholera; but at least equally because the endemic causes of diarrhœa are the causes of much other disease. If the diarrhœal death-rate of England is reduced to that which prevails among the healthier part of the population, typhoid fever (now probably the cause of at least 15,000 annual deaths) will be reduced in more than equal measure. And in proportion as infantile diarrhœa is reduced, the convulsive disorders and respiratory inflammations of infancy (which now cause fully 60,000 annual deaths) will also show a very large, if not equal, reduction of death-rate.

Accordingly, with the above facts and arguments submitted, the Privy Council, so soon as authorized by the Legislature,* determined to have inquiry made into the circumstances of those populations among which the diarrhœal death-rate had been highest. And, possessed of information which the annexed table embodies with respect to the registration-districts of Coventry, Birmingham, Wolverhampton, Dudley, Merthyr Tydfil, Nottingham, Leeds, Manchester, Chorlton, and Salford, selected these places for first inquiry. Dr. Greenhow, hereupon engaged as a temporary Inspector under the Act, was instructed to visit them in succession. And his instructions were to investigate in each place,—first, what was the local distribution of diarrhœal disease; and secondly (so far as was likely to relate to the causation of this disease) what, both generally and with distinction of localities, were the sanitary circumstances of the population.

The results of this inquiry are given in the reports [A]; copies of which are now being sent by the Privy Council to the several local authorities respectively interested in their contents.

Of these it is not practicable to give any short analysis; except, perhaps, by saying, almost in a word, that from first

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* The Act of Parliament which continued the functions of the Privy Council in reference to matters of public health became law on August 1st, 1859, and the necessary instructions for this inquiry were thereupon immediately issued.—J.S.

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to last they consistently illustrate the preventability of diarrhœal death.

One illustration of this fact, belonging to almost all the districts, may be quoted with satisfaction. Generally in them, it seems, there has been for several past years a growing, though still insufficient, perception of the importance of cleanliness:—in all, it seems, something, though far from enough, has been done for sanitary improvement; in some cases, structural deficiencies have been partly supplied; and probably in all cases greater attention has been given to scavenging and other such removal of filth. Except in one town (where well-intended, but ill-devised, endeavours to increase the privy accommodation of the poorer classes have unfortunately been productive of mischief) the local prevalence of diarrhœa has in consequence been reduced. The annexed table compendiously shows the particulars of this reduction.

On the other hand, it must not be concealed that, though a beginning has been made, a vast deal remains to be accomplished. Even those improved death-rates, which are shown in the 1854–58 column of the table, are very greatly in aggravation of what is due.

There are *districts of England in which endemic diarrhœa is unknown.* There are *extensive groups of districts* where (as the last line of the table shows) the *habitual death-rate from diarrhœa does not attain 30;* and even in these districts the existing diarrhœa is assuredly much beyond what it would be if cleanliness were in all cases duly cared for. It is therefore nothing unreasonable, to take their death-rate as a standard for comparison. Tested by this standard, the districts now reported on show, even in their ameliorated state, an extravagant mortality from diarrhœa,—a mortality which is from 3½ to 9 times as high as that of the districts here contrasted with them. It is, therefore, greatly to be hoped, that, by the information now collected and communicated, the respective local authorities in these several districts will be induced to apply with increased vigilance the means which are necessary for removing from their administration the reproach of preventable, but unprevented, disease. And in this

Diarrhœal Districts.

YEARLY NUMBER of DIARRHŒAL DEATHS (Diarrhœa, Dysentery, and Cholera) in the several under-mentioned Registration Districts.

	REGISTRATION DISTRICTS.									
—	Coventry.	Birmingham.	Wolver-hampton.	Dudley.	Merthyr Tydfil.	Nottingham.	Leeds.	Manchester.	Chorlton.	Salford.
Population in 1851 -	36,812	173,951	104,158	106,530	76,804	58,419	101,348	228,433	123,841	87,523
Year.	Diarrhœal Deaths.	Diarrhœal Deaths.	Diarrhœal Deaths.	Diarrhœal Deaths.	Diarrhœal Deaths.	Diarrhœal Deaths.	Diarrhœal Deaths.	Diarrhœal Deaths.	Diarrhœal Deaths.	Diarrhœal Deaths.
1848 - -	79	440	122	240	51	58	243	644	387	224
1849 - -	305	464	1,615	682	1,779	125	1,770	1,791	656	514
1850 - -	67	444	130	174	75	91	204	678	312	192
1851 - -	191	480	190	250	125	140	294	494	258	191
1852 - -	163	511	272	262	124	128	386	937	416	368
1853 - -	121	394	196	214	117	129	270	543	236	243
1854 - -	180	610	372	614	581	179	331	728	348	352
1855 - -	60	308	133	187	93	66	148	449	200	189
1856 - -	77	358	199	208	65	92	184	492	252	203
1857 - -	158	609	285	348	114	221	258	695	321	269
1858* - -	61	352	151	208	78	169	251	472	162	226

* The numbers for this year were only obtained during the inquiry.

Diarrhœal Districts.

AVERAGE ANNUAL PROPORTION of DIARRHŒAL DEATHS per 100,000 of living population.

Population in 1851.	Registration Districts.	DIARRHŒAL DEATHS		Exclusion of Deaths as below, which were ascribed to Epidemic Cholera.
		During the Years 1848–1854.	During the Years 1854–1858.	
36,812	Coventry - - -	350	266	202 cholera deaths in 1849 excluded.
173,951	Birmingham - -	274	233	The few cholera deaths which have occurred (only 99 in the 11 years) are *not* excluded from the calculation.
104,158	Wolverhampton - -	210	193	1,346 cholera deaths in 1849 excluded.
106,530	Dudley - - -	237	221	412 cholera deaths in 1849, and 256 in 1854, excluded.
76,804	Merthyr Tydfil - -	135	106	1,683 cholera deaths in 1849, and 455 in 1854, excluded.
58,419	Nottingham - -	208	234	The few cholera deaths which have occurred are *not* excluded from the calculation.
101,343	Leeds - - -	291	217	1,436 cholera deaths in 1849 excluded.
228,433	Manchester - -	320	228	891 cholera deaths in 1849 excluded.
123,841	Chorlton - - -	270	165	279 cholera deaths in 1849 excluded.
87,523	Salford - - -	303	255	234 cholera deaths in 1849 excluded.
239,791	Standard Districts of England during the years 1847–1855 - - - - -		29	

Diarrhœal Districts.

respect, one paragraph from the following paper,—a paragraph which expresses the most definite result of Dr. Greenhow's observations in all the diarrhœal districts, and which accords with all the best experience previously obtained in other like investigations, deserves to be well remembered:—

> "The excess of mortality has in all the places been coincident with one or other of two definite local circumstances;
> (*a*) the tainting of the atmosphere with the products of organic decomposition, especially of human excrement,—or
> (*b*) the habitual drinking of impure water."

It also deserves to be remembered, both by the local authorities of these districts, and even more by the great manufacturers whose unparalleled wealth is acquired in them, that the extensive factory-employment of female labour is, unless care be taken to avert its effects, a sure source of very large infantile mortality, both diarrhœal and convulsive; that where mothers are engaged in factories, infants who should be at the breast are commonly ill-fed or starved, and have their cries of hunger and distress quieted by those various fatal opiates which are in such request at the centres of our manufacturing industry; and that the labouring classes themselves have not the power of organizing such arrangements as might at least greatly mitigate this evil.

PROCEEDINGS IN REFERENCE TO THE PREVALENT EPIDEMICS OF DIPHTHERIA.

Diphtheria.

During the last four or five years there have been prevailing in various parts of England alarming epidemics of DIPHTHERIA,—a disease which, as epidemic, was previously almost unknown to the present generation of medical practitioners. Not quite unknown, indeed; for, although the last great prevalence of the disease in Britain was during the two middle quarters of last century, there had been since that period, and within living recollection, a few little local epidemics, as well as some isolated cases. But, from the

Diphtheria.

summer of 1855 to the present time, diphtheria has again been continuously prevalent in England; invading different places in succession; sometimes remaining fixed (even for three and four years) where once its footing has been gained; sometimes holding less tenaciously to the place, and leaving it after only some few weeks' tenure; but unfortunately also sometimes returning to it again and again.

These facts have been made known to the Privy Council; and, in consequence, during the past year, extensive inquiries have been made, under orders of the Privy Council, with a view to collect for common use the various particulars of experience which different localities could supply. Much correspondence has taken place with this object; and the principal seats of the epidemic (to the number of 70, situate in 17 different counties of England) have, during the year, been personally visited for the purposes of more minute inquiry. The valuable information thus collected is given in the following papers [A].

Had time allowed, it might have been desirable to bring the mass of material into a somewhat different arrangement. But even the present primary compilation has but quite recently been completed; and though the utmost despatch has been used, it has been found barely possible to include the information, as it now stands, in the present Annual Report. On the whole, however, it has seemed far better to take this course, than to let a year elapse before the publication of matter which may be of much professional use. All the more, too, this course has seemed eligible, because the present papers represent only in part the facts of a visitation which unfortunately is still in progress. And before the history of the present epidemic can be adequately written, much other information has to be collected.

To illustrate the great difficulties which in this country attend any attempt to investigate scientifically the facts of epidemic disease, it deserves consideration that no periodical returns are here made with respect to disease treated at the public expense; nor is any local authority bound (however needfully for the public good) to give information to the Government as to the outbreaking of any unusual epidemic.

Diphtheria.

Diphtheria had been prevalent in parts of England for two years before there was any public knowledge of the fact;* and under these circumstances, it has been scarcely possible to procure any trustworthy record of the first beginnings of the disease. Even as regards a less exact kind of observation, the Registrar-General has not had it in his power to supply, for the use of the Privy Council, such an account of the deaths from throat-diseases during successive quarters of the last few years as might have enabled the course of the epidemic and the distribution of its mortality in different

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* Diphtheria began to be prevalent in Cornwall in the autumn of 1855. It was not till November 1857 that the then existing General Board of Health had such information as justified its issuing any public notification on the subject. In the number of the *Weekly Return of Diseases in the Metropolis* (printed by the Board) with reference to the week ending Saturday, October 31st, 1857, there was contained the following passage :—"In future numbers of the *Weekly Return* a separate column will be allotted to new cases of *Diphthérite*;—a peculiar, very dangerous, febrile disease, attended with destructive inflammation in the mucous membrane of the throat, and specially marked by the formation there of an *adhesive or croupy false membrane* which conceals the inflamed surface, and belongs (not, as in true croup, to the respiratory passages, but) especially to the pharynx and fauces. *Diphthérite* is a word which, according to its etymology (διφθέρα, a hide or membrane) has been applied to many diseases in which the presence of a croupy exudation is a remarkable feature; but in England it is commonly received in the limited sense of diphtheritic (*i.e.* false-membrane-forming) inflammation of the pharynx. This disease has no popular English name; for, though it has been well known and well described in France, it has hitherto in England been comparatively unknown as an idiopathic complaint. At the present time *diphthérite* threatens to demand more attention in this country; for apparently it is to its prevalence, as a cause of death in several districts, that various registrars' notes in the late quarterly report of the Registrar-General refer. In these notes, 'inflammation of the throat,' 'putrid sore throat,' 'malignant sore throat,' 'disease in the throat,' and 'throat fever,' are the expressions used to designate a complaint which has proved fatal in the registration districts of Thame, Billericay, Maldon, Liskeard, Truro, and Chesterfield; and other information makes it probable that an unusual disease of the throat is prevailing more or less epidemically in some other parts of the country. There is reason to believe that cases are also occurring within the limits of the metropolis; sometimes recognized in their true nature, and called either diphthérite or Boulogne fever; sometimes, perhaps, mistaken for true croup, or for the throat-inflammation of scarlet fever, or for some other disease. Cases of this unfamiliar complaint will be interesting to the officers of health; who, with a view to the prevention of the disease, will of course be anxious to collect information both as to its predisposing and exciting causes, and as to the symptoms which betoken its commencement. It is therefore important that the many names under which it may appear in the registers of sickness and mortality should be borne in mind."—J.S.

Diphtheria.

districts to be at least approximately mapped out. And the information now submitted, as the fruit of inquiries made by the Privy Council, relates (as already stated) to only parts of the visitation.

APPENDIX.

Heads for Local Inquiry in Diphtheria Districts.

HEADS for LOCAL INQUIRY in DISTRICTS where DIPHTHERIA has been EPIDEMIC.

1. *As regards the general features of the District.*

a. What is the character of the district as to level, exposure, soil, drainage, and (if rural) cultivation, or (if urban) density of building?

b. What is the source, and what the general character of the water-supply of the district?

c. Is the district liable to ague, to autumnal fever or diarrhœa, to bronchocele, or to any other endemic disease?

2. *As regards the duration, extent, and novelty of the Epidemic in the District.*

a. When was the first, and when the last, case of Diphtheria in the district?

b. What was the number of attacks of Diphtheria, what the number of deaths occasioned by it, and what the number of houses among which the attacks were distributed?

§ Append any lists which individual practitioners will furnish, according to the accompanying form, of the cases which they respectively have attended.

c. Is there any local recollection of Diphtheria having prevailed before in the district or neighbourhood? if so, when? and to what extent?

3. *As regards contemporaneous or recent diseases in the District.*

a. Did other varieties of sore-throat (*i.e.* varieties not attended by the formation of false membrane) prevail in the district at about the same time as Diphtheria? If so, did they precede, or accompany, or follow, its prevalence? And did they in any cases prove fatal, or present unusual features?

b. Did scarlatina prevail in the district at about the same time as Diphtheria? If so, did it precede, accompany, or follow? And did it present unusual features?

c. Did erysipelas or puerperal fever?

d. Did common continued fever?

Heads for Local Inquiry in Diphtheria Districts.

e. Did any other disease, either of the human subject or of the lower animals, prevail in the district to an unusual extent, or with unusual features, either during, or shortly before, or shortly after, the prevalence of Diphtheria?

4. *As regards local and personal conditions predisposing to Diphtheria.*

a. In what number, and with what severity, did cases occur in dry and airy parts of the district, as compared with low lying, damp, and confined parts?

b. In what number, and with what severity, did cases occur in thoroughly well-constructed and well-kept houses or rooms, as compared with houses or rooms in which the atmosphere was offensive from defects of drainage, or from over-crowding and non-ventilation, or from other kinds of uncleanliness?

c. Had the houses in which Diphtheria was prevalent been previously much subject to any [and, if any, what?] other kinds of disease?

d. In what number, and with what severity, did cases occur among persons enjoying affluent or comfortable circumstances of life, as compared with persons suffering privation?

e. What has been observed as to the influence of age, occupation, habit of body, and personal antecedents, in increasing or diminishing the liability to contract Diphtheria, or to suffer any of its symptoms in a severe form?

Was any difference in this respect observed between persons who had, and persons who had not, previously had scarlatina?

5. *As regards the communicability of Diphtheria.*

a. Did it often happen [and, if so, give instances] that cases of Diphtheria occurred singly in households where there were children in free communication with the patient?

b. Did it often happen [and if so, give instances] that all or nearly all the inmates, or all or nearly all the children, of considerable households were eventually attacked with Diphtheria, in houses where one case had arisen? or that they were attacked with any other kind of sore throat?

c. Where two or more cases occurred in succession in one house, what commonly was the interval between them?

d. To what extent is it the case (either as regards the district generally, or as regards particular houses and establishments in the district) that the persons first attacked with Diphtheria had previously been in communication with houses wherein that disease was prevailing?

Heads for Local Inquiry in Diphtheria Districts.

or with houses in which some other kind of sore-throat was prevailing? or with houses in which scarlatina was prevailing, or with houses in which erysipelas, or any other kind of febrile or inflammatory disease was prevailing?

If in any case diphtheria seems to have resulted from such communication, what was the nature of the communication? And what time elapsed after the communication before the new case of diphtheria commenced?

Did it ever appear that diphtheria was propagated by accidental inoculation or contact with the morbid secretion of the throat?

If, among persons equally communicating with the sick, some were attacked with diphtheria, while others remained free from it, to what was this difference attributed?

6. *As regards the symptoms of Diphtheria.*

Did Diphtheria, as observed in the district, differ in any [and, if any, what?] important respect from the account given of it, generally, in the following paragraphs; viz. :—

a. that the essential local sign of the disease, seen on inspecting the throat of a patient in the early stages of Diphtheria, is the presence of a fibrinous exudation, more or less firmly coagulated upon the inflamed surface of the fauces, tonsils and pharynx; where, blended with the epithelium of the part, widening as the inflammation extends, and becoming thicker by successive additions to its deep surface, it appears as a continuous raised layer of white or whitish membrane (*diphthera*) and tends after some days to be thrown off, like a slough, in a partially decomposed state?

b. that the diphtheric inflammation is never primarily attended by any ulceration or sloughing of the mucous membrane, though in some cases these processes occur at later stages of the disease: but that always at first there lies beneath the false-membrane a merely excoriated surface; on which, while in this state, there may coagulate, before healthy epithelium is restored, successive new layers of fibrinous matter more or less mixed with the corpuscular products of inflammation?

c. that the diphtheric inflammation, besides generally extending to the mucous membrane of the nose (where also, though rarely, it may begin, and where in either case its presence may occasion epistaxis) sometimes descends along the mucous membrane of the air-passages; superadding, in such cases, the ordinary symptoms and dangers of croup to those of the original affection?

d. that usually the lymphatic glands below the jaw, and sometimes the cellular membrane of the neck, are more or less irritated and swollen during the inflammation of the throat?

Heads for Local Inquiry in Diphtheria Districts.

e. that the disease is not, except sometimes at its beginning, attended by febrile excitement; but is commonly, throughout its course, marked by signs (often by alarming signs) of depression?

f. that more or less irritation of the kidneys is of very frequent, if not universal, occurrence at some period or other of the disease; involving, while it lasts, an albuminous state of the urine, and the presence in it of microscopical casts of the urinary tubules?

g. that the disease may be complicated with other internal inflammations—especially with pneumonia; and that intestinal hæmorrhage may occur during its course?

h. that patients often remain in a state of anæmia and weakness, even of dangerous weakness, long after the throat-affection has ceased; and that some of them, during this condition, suffer functional nervous disorder—such as impairment of vision, partial loss of sensation, or paralytic or convulsive affection of voluntary muscles?

§ Append any notes which individual practitioners will furnish, of carefully observed cases of diphtheria, wherein either its less frequent symptoms or complications have occurred, or its common symptoms have been minutely investigated; *e.g.*,

of cases, if any, where cutaneous eruption has appeared—the exact character of which should be specified, as also the period of the disease during which it was visible, and the issue of the cases in which it was observed; of cases, if any, in which the skin has desquamated;

of cases in which the throat-affection has been accompanied or followed by serious inflammation of internal organs, or by any kind of hæmorrhage; of cases, if any, in which dropsy has ensued;

of cases in which peculiar nervous sequelæ have been well marked;

of cases, if any, in which a blistered or otherwise excoriated surface of the patient's skin, or the mucous membrane of the pudenda, has taken on anything like diphtheritic inflammation;

of cases in which the urine has been specially examined day by day during the disease;

of cases in which the temperature of the body has been noted;

also of any carefully made post-mortem examination, especially such as may illustrate the internal complications of the disease;

also of any precise observations which may show the value of particular symptoms as guides to favourable or unfavourable prognosis.

Heads for Local Inquiry in Diphtheria Districts.

7. *As regards the treatment of Diphtheria.*

a. Has any treatment been found more effectual than the use of ordinary escharotics (*e.g.* nitrate of silver or hydrochloric acid) to arrest the formation of false membrane in the throat? If any cases were treated without escharotic or stimulant applications, what was the result?

b. Has any treatment been found more effectual than the use of alcoholic stimulants to counteract the depression which belongs to severe cases of the disease?

c. If tracheotomy has in any cases been performed for the relief of laryngeal obstruction arising in the disease, what has been the number and what the result of such cases? Has any treatment been, under the circumstances, more successful than tracheotomy?

d. What treatment has been adopted, and what result has ensued, in cases of internal inflammation complicating the disease.

e. Has any treatment been found more effectual than the use of ordinary tonics to remove the sequelæ of the disease, especially those that affect the nervous system?

f. What knowledge has been obtained as to the fact of any particular drug exerting a specific influence against the disease?

Privy Council Office, London, S.W., 1859.

From the Third Report to the Privy Council, 1860.

[The Third Report comprises sections relating to Vaccination and the Distribution of Disease in England. The former has appeared in Vol. I., pp.345–52, and the latter is subjoined. It relates to industrial occupations which cause Lung Disease.—Ed.]

DISTRIBUTION OF DISEASE IN ENGLAND, AND THE CIRCUMSTANCES BY WHICH IT IS REGULATED—*cont.*

Lung-Diseases.

High local death-rates from particular kinds of disease.

In the last report which I made to the late General Board of Health,—a report which, as regards its subject-matter, was introductory to the annual reports which I have now the honour of submitting to the Privy Council,—I drew attention to the fact, strikingly displayed in some statistics which Dr. Greenhow had then recently compiled, that *certain dis-*

*eases, which, among them, make up fully half of our annual mortality, are fatal in widely different degrees in different districts of England.**

High local death-rates from particular kinds of diseases.

For instance:—while DIARRHŒAL DISEASES had been causing in England annually more than 26,000 deaths, the rate† of mortality from these diseases had ranged from 4, 8, 10, 14 and 17 in some districts, to 463, 493, 513, 568 and 663 in others. So again, while FEVER had been killing annually more than 17,000 persons, the death-rate by fever in different districts had ranged from under 50 (already a grievous excess) to more than 200. Similarly with regard to those diseases which are the most common CAUSES OF INFANTINE MORTALITY—diseases which had annually been killing more than 100,000 young children, death-rates had ranged from about 1,300 to about 9,000. Other death-rates, which are among the most important in the register, the death-rates of the adult population by PULMONARY DISEASES had ranged, as regards grown-up men, from 221 and 306 to 1,298 and 1,440. Death-rates by PHTHISIS alone among grown-up women had ranged from 229 to 558.

On the ceasing of the General Board of Health, the above very suggestive facts came under cognisance of the Privy Council. The inference was inevitable, that, to account for so unequal a distribution of particular kinds of death, there must prevail almost corresponding inequalities in the distribution of causes of disease. And their Lordships, authorised by the Legislature "to cause to be made such inquiries as they " see fit in relation to any matters concerning the public " health in any place or places," concluded that this apparent localisation of particular morbid influences was quite especially a fit matter for inquiry.

Accordingly, during 1859, inspections were made in what, for brevity, may be termed the DIARRHŒAL DISTRICTS of England. And my last year's report contained a statement of the results which that proceeding elicited.

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* "Papers relating to the Sanitary State of the People of England."—J.S.

† The rates are all proportionate to a hypothetical local population of 100,000 living.—J.S.

Lung-diseases.

During 1860 similar inspections have been made with regard to another great class of fatal diseases. The problem of the year has had reference to DISEASES OF THE LUNG:—Why is it, that, in some districts of England, grown-up men or women die from these diseases, or from some of them, three times, four times, even six times, as abundantly as in other districts?

Our large adult mortality from lung-disease is of course very compound in its kind; but two special diseases, between them, make up most of its amount. *Tubercular phthisis* is one of these chief factors; *bronchitis* with its effects is the other. And, with respect to both of these affections, it seemed certain that their great development in particular districts has essentially to do with the industrial relations of the people.

In analysing the statistics of lung-disease, a first great contrast was found to lie between populations, respectively agricultural and manufacturing:—*in proportion as the male and female populations are severally attracted to in-door branches of industry, in such proportion, other things being equal, their respective death-rates by lung-disease increased.* And there are medical reasons, which need not now be detailed, for assuming the augmented "lung-disease" to be PHTHISIS. What is the meaning of this fact?

In the medical mind it at once associates itself with a very important result, which was well developed seventeen years ago by the late Dr. Baly, in his admirable essay on the *Diseases of Prisons.* From examination of the medical records of the Millbank Penitentiary, Dr. Baly had learnt "that the mortality caused by tubercular disease had been between three "and four times as great during the 18 years, 1825–42, among "the convicts confined in this prison, as it was in the year "1842 among persons of the same period of life in London "generally; and that three-fourths of the excess of deaths "from all causes in the penitentiary above the rate of mortality of all persons in the metropolis of the same period of "life had been due to the prevalence of that disease." Comparing the large number of prisoners in whom tubercular disease of the lungs first showed itself while they were in the

Lung-diseases.

penitentiary with the small number who were affected with it at the time of their reception, he was convinced "that "imprisonment exerted here a very powerful influence in "causing the development of the disease." Extending his inquiry to the other prisons of England, and to the persons of other States in Europe and America, he found that the influence was one of universal operation, and learnt (as might have been expected) that other forms of scrofula were developed in the same proportion as pulmonary phthisis; that not merely this one form of the infliction, but tubercular disease in all its forms, resulted from the long-continued influence of imprisonment on the bodily health.* This influence appears to be partly physical and partly moral:—among its component parts (with cold and poorness of diet) Dr. Baly enumerates *deficient ventilation, sedentary occupations, and want of active bodily exercise,* and *a listless or dejected state of mind.* Of the points thus enumerated, there are some in which the life of textile factory-populations, and of certain other in-door work-people, is comparable to the life of prisoners. Taking, for instance, the case of girls and women who from childhood onwards sit ten hours a day or more, often in constrained postures, weaving or knitting at looms and stocking-frames, or plaiting straw, or stitching gloves, or lace-making:—this life, at its best, has to a great extent the evils of monotony, of deficient bodily exercise, of physical seclusion from sun and air, and of mental privation from what is beautiful and animating in external nature. And thus probably, even at its best, it tends to produce somewhat of vital depression, somewhat of mental and bodily etiolation, during which, especially with persons otherwise predisposed to scrofula, there is a heightened liability to tubercular disease. Where an industrial system is bad,—bad, either in excessive length of daily work, or in the over-crowdedness and non-ventilation of work-places, these evils may be vastly developed. Their

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* During the years which have elapsed since the publication of Dr. Baly's paper, progress has been made toward removing from prison-life many known causes of scrofulous disease. And as the fever-mortality of Howard's time long ago followed the removal of its causes, so, no doubt, the high tubercular mortality of prisons is at present in course of extinction.—J.S.

Lung-diseases.

maximum may be expected to prevail in places where an over-tasked population does its work in ill-ventilated factories and cottages.

From these considerations, it would of course not necessarily follow that an excess of phthisis, prevailing in our great centres of manufacture, is, in any practical sense, preventable. But at least there was great encouragement to inquiry. Should it appear that a high development of phthisis among men and women employed in certain manufactures is really an essential appanage of the employment, even when not excessively laboured in, then perhaps might be borne, without fruitless repining, this tax on the industry of our people. But should it, on the contrary, appear that the production of disease in each phthisis-breeding employment depends in great part on sanitary faults which might be eliminated from the employment—on defective ventilation, for instance, and other like influences, then at once the way would be opened to an improved economy of life in many chief branches of popular industry. [See footnote at page 455, Vol. I.] Accordingly, as regards phthisis, these considerations were submitted to their Lordships.

Our statistics of lung-disease had justified a second generalisation. Conspicuous among the suffering districts, stood places which are the chief seats of metal-mining,* of metal-manufacture, and of pottery-manufacture. And there were medical reasons for presuming that in these places the predominant lung-disease was, at least primarily, BRONCHITIS. For, with reference to this disease, two kinds of occupation have long been recognised as peculiarly hurtful;—first, those which give rise to *mechanical or chemical irritation of the air-passages*, by diffusing in the air of work-places any considerable amount of metallic or earthy grit, or of acrid smoke or vapor, or even of dust or fluff from flax, cotton

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* Special reference was made to "the most exclusively lead-mining district in "England" as one, which (though remote from city influences, and situated in the midst of a most salubrious country) had been losing by diseases of the lung, in consequence of its prevalent occupation, a "larger annual proportion of its "adult male inhabitants than the unhealthiest city in the kingdom, and as the "place in which there is a larger proportion of widows than in any other place in "the kingdom."—J.S.

Lung-diseases.

or wool; secondly, those in which the operatives are exposed to *abrupt changes of temperature.* And it was notorious that, in one or both of these respects, abundant causes of bronchitis might exist in the above-mentioned branches of industry, as also in some textile occupations. Indeed, except where special provision is made against them, such causes could not fail to affect considerable classes of operatives; those, for instance, whose breath is drawn amid the metallic spray of a cutler's grinding-wheel, or amid the blast-soot and rock-dust of metal-mining, or amid the products of flax-hackling and cotton-carding, or amid clouds of flinty powder in the pressing and scouring rooms of a pottery; or those, on the other hand, who work in such air as serves to evaporate potters' slip, or beside the stoves where earthenware is dried, or amid the hot-water troughs from which flax is spun, or in the heat of copper-mines, and who, during their work or in leaving it, run all chances of other temperature. To what extent provision is actually made against the dangers referred to, could not without inquiry be exactly stated. Nor could it in the first instance be judged to what extent such evils, where prevailing, could readily be reduced or removed. But meanwhile the case, as it stood, was submitted to their Lordships.

And commonly, with reference to both phthisis and bronchitis, this further conclusive proof was given as to the influence of an accused occupation; viz., that the high death-rate from lung-disease belonged specially, according to the occupation, to the men, or to the women, of the district; that it sometimes was nearly twice as high for the employed sex as for the unemployed sex; and that it only extended to both sexes, where both were engaged in the occupation.

Their Lordships, having considered the above facts in their relation to certain large branches of industry, and having been pleased to accept my opinion that, in order to render those facts applicable to particular cases, more circumstantial evidence must be collected, ordered that, for this purpose, inquiries by an inspector should be made at some of the principal seats of the accused occupations. The places selected for inquiry were the following;—

Lung-diseases.

STOKE - UPON - TRENT and WOLSTANTON, in both which places the population, male and female, is largely employed in the *making of earthenware and china ;*

BROMSGROVE, ALCESTER and SHEFFIELD, where the chief occupation, male and female, is *working in iron ;*

PENZANCE and REDRUTH, where *tin-mining* and *copper-mining* are the special pursuits of the men, and give also some employment to women ;

REETH, where half the adult men are employed in *lead-mining ;*

PATELEY BRIDGE, where there is also some lead-mining, but where specially there is work in *flax-factories* for both male and female population ;

MACCLESFIELD and LEEK, where the population, both male and female, is largely employed in *silk-working ;*

LEEDS, BRADFORD, STROUD, and MELKSHAM, where people of both sexes work specially in *wool-factories ;*

Population in 1851.	Registration Districts.	DEATH-RATES by Pulmonary Diseases, including Phthisis.	
		Males.	Females.
57,942	Stoke-upon-Trent	721	665
41,916	Wolstanton	726	727
24,822	Bromsgrove	583	559
17,482	Alcester	559	577
103,626	Sheffield	839	670
53,517	Penzance	560	456
53,628	Redruth	670	450
6,820	Reeth	724	528
7,579	Pateley Bridge	508	391
63,327	Macclesfield	691	804
23,031	Leek	588	705
101,343	Leeds	817	718
181,964	Bradford	611	603
37,386	Stroud	511	511
18,815	Melksham	626	559
60,642	Leicester	740	659
15,595	Hinckley	652	603
96,545	Preston	776	768
12,806	Towcester	475	573
23,109	Newport Pagnell	490	545
12,527	Berkhampstead	401	566
28,463	Yeovil	528	591
20,716	Saffron Walden	520	612
	As Standards for comparison :—		
56,637	Six Northern Districts	297	304
71,330	Six Southern Districts	411	454
183,154	Ten South-Western Districts	446	395

N.B.—Each death-rate is proportionate to a hypothetical population of 100,000 males, or 100,000 females. The death-rates are calculated *without distinction of age.* Were they calculated for only the working ages of life, the contrasts would appear much more marked. The contrasts might also be far better shown, if it were possible to give the death-rates of *special operatives* exclusively, instead of giving the death-rates of whole districts. The death-rates are for the seven years 1848–54 except in regard of the standard districts, where, they are for the nine years 1849–54.

LEICESTER and HINCKLEY, where the *making of hosiery* occupies a large part of the population, both male and female. Lung-diseases.

PRESTON, where the principal employment of both sexes is in *cotton-factories ;*

TOWCESTER and NEWPORT PAGNELL, where the female population is largely engaged in *lace-making ;*

BERKHAMPSTEAD, where the female population is largely engaged in *straw-plaiting ;*

YEOVIL, where some of the male, and a large proportion of the female population are engaged in *glove-making ;*

SAFFRON WALDEN, where the industry is *agricultural,* and where the causes of pulmonary disease are not of an occupational kind.

And the statistical evidence which led to this selection of places is expressed in the adjoining table ; where at a glance may be seen the proportion of mortality from lung-disease in each inspected district as compared with certain suitable standards of health.

The local inquiry was entrusted to Dr. Greenhow, whose valuable statistical compilation, already referred to, had first demonstrated the full importance of the subject. And the instructions, which, under their Lordships' orders, I gave for the inquiry, were to this effect :—that Dr. Greenhow, visiting the enumerated districts (with a view to ascertain in each of them, as far as possible, what is the present pressure of pulmonary disease on the adult population, and what local circumstances contribute to cause any excess which may be discovered of such disease) should, in each district, particularly inquire of the registrar of deaths as to the degree in which the local death-rate by pulmonary disease is influenced by the deaths of persons engaged in such occupations as are more or less special to the district ; that he should also in each district seek to learn from the officers of friendly societies, of medical charities, and of the poor law service, in what amount and with what distribution pulmonary disease habitually exists among the adult local population ; that in any case where much pulmonary disease is found to be concurrent with the pursuit of any particular occupation, he should inquire into the details of the occupation, especially with regard to those influences

Lung-diseases.

in it which seem likely to be hurtful to health, and should personally observe the actual state of health of operatives exposed to such influences.

From the Fourth Report to the Privy Council, 1861.

[The Fourth Report comprises sections relating to Vaccination and the Distribution of Disease in England. The former has appeared in Vol. I., pp. 353–6, and the latter is subjoined. It relates—(1) to industrial occupations which cause Lung Disease; (2) to the causes of excessive infant mortality in some manufacturing places.—Ed.]

DISTRIBUTION OF DISEASE IN ENGLAND, AND THE CIRCUMSTANCES BY WHICH IT IS REGULATED—*cont.*

Since 1858 there has been in progress, under their Lordships' orders, a systematic investigation of the circumstances under which particular districts in England suffer an excessive mortality from particular sorts of disease. The inquiries made under this head in 1861, and now requiring to be separately spoken of, were as follow:—

(1) an inquiry continuing that of 1860, into the circumstances under which there is in certain districts a great ADULT MORTALITY FROM LUNG-DISEASES; and

(2) an inquiry into the circumstances under which there is in some districts a great MORTALITY OF YOUNG CHILDREN.

1. *Excessive Adult Mortality from Lung-diseases in certain Districts of England.*

Inquiry into Adult Mortality from Lung-diseases.

Inquiry as to locally prevailing causes of Lung-Disease was made, during 1861, at the following important centres of industry:—Birmingham, Aston, Nottingham with Radford and Basford, Wolverhampton, Merthyr Tydfil, Abergavenny, Coventry and Blackburn.

During 1860, inquiry for the same purpose had been made in other places and neighbourhoods, as follows:—Stoke-upon-Trent, Wolstanton, Bromsgrove, Alcester, Sheffield, Penzance, Inquiry into Adult Mortality from Lung-diseases.

Redruth, Reeth, Middleton, Pateley Bridge, Macclesfield, Leek, Leeds, Bradford, Stroud, Melksham, Leicester, Hinckley, Preston, Towcester, Newport Pagnell, Berkhampstead, Yeovil, and Saffron Walden.

The inspections of 1861 were, like those of 1860, made by Dr. Greenhow.

Origin and scope of the inquiry.

(i.) The inquiry starts from a statistical basis. An investigation of the death-registers had shown that in certain districts of England—districts which are specially the seats of particular kinds of industry—grown-up men or women die from diseases of the lung, or from some of such diseases, three times, four times, even six times as abundantly as in other districts of England. And the object of the inquiry was to trace this effect to its causes. Especially—since the great local excesses of lung-disease go with certain industrial relations of the people, it was necessary to ascertain, with regard to each inspected place, what definite causes of lung-disease are involved in the particular local industry.

The occupations, which have thus had their sanitary circumstances reviewed, are some of the largest branches of popular industry:—*cotton-work*, *silk-work*, *flax-work*, and *wool-work*, in their several respective departments, at Preston, Blackburn, Macclesfield, Leek, Coventry, Pateley Bridge, Leeds, Bradford, Stroud and Melksham; the *making of earthenware and china* at Stoke-upon-Trent and Wolstanton; the *manufacture of watches* at Coventry; the *making of hosiery* at Leicester, Hinckley, Nottingham Radford and Basford; of *straw-plait* at Tring, and Berkhampstead, and of *lace* as Towcester, Newport Pagnell, Nottingham, Radford and Basford; *tin-mining*, *copper-mining*, *coal-mining*, *iron-mining*, and *lead-mining*, at Redruth, Penzance, Wolverhampton, Merthyr Tydfil, Abergavenny, Reeth, and Pateley Bridge*; the *smelting of metals* and the *making of metallic instruments*, large and small, at Merthyr Tydfil, Abergavenny,

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* Dr. Greenhow, two years before, had on his own account studied the case of lead-mining at Alston Moor; and his report of 1860 on the lead-mining of Reeth and Pateley Bridge was strengthened by what he had learnt in 1858 at Alston.—J.S.

Origin and scope of the inquiry.

Wolverhampton, Bromsgrove, Alcester, Aston, Birmingham, and Sheffield; also, at the latter two places, the *making of miscellaneous knick-knacks* from pebbles, shells, ivory, horn, wood, gutta percha, &c.

General results of the inquiry.

(ii.) The results of this very large inquiry are, in one sense of the word, satisfactory. They answer the question which claimed investigation. They establish in detail what had appeared generally in the statistics. They explain how it is that the inspected occupations are so hurtful to those who follow them,—how it is, that, in much of our best national industry, the workman, by reason of his work, loses some considerable part of his life.

Want of ventilation in in-door work-places.

a.) In the first place, apart from whatever unwholesome influences belong to the special nature of this or that industrial process, it has appeared to be the general fault of the inspected in-door employments, that the work-people are apt to pass their day—often a very long day—in rooms which are more or less unwholesome through want of ventilation. In a very large proportion of cases this unwholesome condition prevails to such an extent, that deaths by phthisis and by other tubercular and scrofulous diseases might be expected abundantly to result from it.

The evil occurs under different industrial circumstances:—one industry is followed in the houses of the work-people another with more or less aggregation in common workplaces. But throughout the whole scale, from the humblest cottage industry even up to the highest developments of our factory system, amid infinite differences of occupation, the same great removable evil abounds. And in scene after scene of honest industry and independence, the medical eye sees monotonously this one terrible shadow of suffering and death.

For details illustrating the general statement I refer to the inspector's reports;—to what he says of the life led by straw-plaiters, lace-makers and glovers at Berkhampstead, Tring, Towcester, Newport Pagnell, Nottingham, Radford, Basford and Yeovil; of the life led by watch-makers at Coventry; of the life led by button-makers, jewellers and

Want of ventilation in in-door work-places.

various knick-knack-makers at Birmingham and Sheffield; of the life led by stocking-makers, especially such of them as work with the old knitting frames, at Leicester, Nottingham, Radford, Basford and Hinckley; of the life led by pottery artisans, especially by the decorators of earthenware, at Stoke and Wolstanton; of the life led by factory operatives employed on cotton, silk, flax and wool, at Preston, Leeds, Bradford, Pateley Bridge, Macclesfield, Leek, Stroud, Melksham, Coventry and Blackburn, and by operatives, not under the Factory Act, employed at some of these places in particular branches of the same industries.

Duly to appreciate the evil of an unventilated work-place in any of the cases referred to, one must have under consideration the whole life of the artisan who suffers from it, and all the circumstances of his industry. One must remember that, in most cases, either the artisan's ill-ventilated work-place is also his ill-ventilated dwelling-place, or else the dwelling-place to which he goes for his rest is as ill-ventilated as the work-place which he leaves; that during a great part of the year the work-place has artificial light in it, in many cases gaslight, for some hours of the day, and in some cases has its atmosphere vitiated by other products of combustion; that in factories during winter the commonly adopted method of warming is one which itself makes the air unpleasant, if not hurtful, for breathing; and that in many branches of industry (in instances to be hereafter adverted to) good ventilation is essential as a safeguard against evils which are special to the employment—essential for the removal of an injurious dust, or for the abatement of an oppressive temperature. One must remember, too, that the artisan's in-door employment is essentially dull and cheerless, is in a large proportion of cases sedentary, and is in some cases combined with an almost deforming constraint of bodily posture,—that the working day thus spent is commonly of at least 10 hours duration, and sometimes extends to 12, 14, and even 16 hours,—that such life, at its best, is not wholesome,—that with the scanty or monotonous bodily exercise which it implies, with the seclusion from what is beautiful and animating in external nature, the artisan's standard of health

Want of ventilation in in-door work-places.

is necessarily low,—that probably his occupation, even without aggravating circumstances, gives him, proportionately to his length of daily work, a heightened liability to tubercular disease,—and that, among the aggravating circumstances which may indefinitely increase this evil, probably none is so effective as the bad ventilation of his work-place.

Atmospheres which specially irritate the lungs.

b.) In the second place, it has appeared that in many of the inspected employments there are special sources of danger to the lung, by way of direct irritation; and that against these various special dangers little effectual precaution is taken.

Thus, in some gigantic branches of our national industry—such as the textile manufactures, the manufacture of earthenware and china, the manufacture of steel and iron, and in many less extensive occupations, work-people in large numbers, sometimes nearly all who are employed in particular departments of the business, break down prematurely with lung-disease, under pressure of the mere dustiness of their occupation. For, in the cases referred to, the "dustiness" in the occupation implies that the artisan, during his dust-making work, draws at each breath into his air-tubes a notable quantity of finely divided metal, grindstone, flint, clay, shell, ivory, bone, charcoal, wool, cotton, flax, silk, or other material which is in use; and, putting aside all question of the immediate inconvenience thus occasioned (which presently ceases to attract the artisan's attention) the gradually accumulating consequences of the habitual irritation are—primarily, confirmed bronchitis, and secondarily, in the graver cases, an irreparable destruction of lung-texture.

Again, in the operation of mining there is, as will presently be shown in detail, special danger to the lung, from influences which, if not very successfully dealt with, render the subterranean atmosphere both chemically and mechanically unfit for respiration. And so imperfect hitherto has been the adoption of safeguards against this danger, that, with one very notable exception, miners, as a class—and the class includes in England alone more than 300,000 workmen—break down prematurely with bronchitis and pneumonia, caused by the atmosphere in which they labour.

Atmospheres which specially irritate the lungs.

In other branches of industry there is the influence of working in an atmosphere much altered by heat, and of alternating between that atmosphere and the common, perhaps wintry and inclement, outside atmosphere. In many of the inspected occupations, bronchitis, attributable to this influence, appears to be extremely frequent:—both in cases where the hot industrial atmosphere is very moist and steamy, as in the slip-making department of potteries, and in the so-called "roving," or wet-spinning department of flax factories; and also in cases where the industrial atmosphere is high dried by heat,—especially if the dry heat be (as it commonly is) an attendant circumstance of defective ventilation, or co-operate with other influences likely to irritate the lungs (as in dusty departments of earthenware making and of textile industry) or be combined with the hurtfulness of accumulating gases from combustion, as in the instance of hand-woolcombers, who work with unchimneyed furnaces beside them.

Illustrations of the production of industrial lung-disease.

(iii.) In order to illustrate the preceding observations, it may be convenient that I refer, with some detail, to a few typical cases where such evils as I have adverted to attain their largest dimensions. And for this purpose I submit the following instances:—

Grinders and polishers of steel.

a.) In metallic manufacture, the grinders and polishers of steel are the worst sufferers. Their work—abundantly illustrated in the inspected districts of Bromsgrove, Alcester, Sheffield, Aston, and Birmingham—consists in giving final shape and smoothness to the edges, points and surfaces of innumerable steel instruments—knives, forks, razors, scissors, chisels, needles, saws, files, scythes, swords, bayonets, gun-barrels, fish-hooks, gimblets, spindles, fire-irons, &c.; and as this final shaping and glazing of hard metal is done by the rub of revolving grindstones and emery wheels, dust is of necessity produced in every step of the process,—dust, which may be extremely fine, but is of almost adamantine hardness. The diffusion of this dust into the air of work-places is not nearly so great in wet-grinding as in dry-grinding; for in wet-grinding the surface of the wheel as it revolves dips into

Grinders and polishers of steel.

water, and carries thither a large proportion of the detritus which otherwise would be diffused into the air; but even in this case there continues a perceptible diffusion of the dust, and unfortunately the grinder suffers a special inconvenience in the damp to which he is habitually exposed. Moreover, the dust of mere grinding and polishing is by no means the only dust of the work-places in question. For, first, each grindstone, when new, must itself be rough-ground into shape by the workman; and afterwards, perhaps twice or thrice a day, its worn surface must be fresh roughened for use; and in these processes of "razing" and "hacking," as they are called—processes which dry-grinding and wet-grinding have in common—great clouds of grit, rising from the wheel, first densely envelop the operator and then diffuse through the work-place.

It has long been known that the spray of these processes makes a deadly atmosphere for men who breathe it; and against this great evil some not inconsiderable pains have been taken. To a great extent it is now the case that the dry-grinder's wheel moves in a partial wooden casing, from within which the dusty air is constantly being drawn by a revolving fan into an air-shaft away from the workman. Yet, notwithstanding this contrivance, the employment continues greatly hurtful;—first, because the ventilated wheel-box is used only in dry-grinding; secondly, because in dry-grinding it is not universally used; thirdly, because, even where it is used, there still escapes into the work-place a considerable residue of dust from the processes of grinding and glazing; and, fourthly, because it has no sensible influence on those clouds of dust which the processes of razing and hacking engender.

The report made of the health of grinders is, that few of them work continuously for many years without suffering more or less from the occupation. At first there is oppression at the chest, followed by shortness of breath, cough, and expectoration; symptoms which advance slowly, and attract little notice, till they get aggravated by catarrh; after a while, the bronchitis which they indicate gets complicated with solidification of the lung; and eventually, it is said, the lung undergoes changes of an ulcerative kind. Among 21 grinders, aged thirty and upwards, whom Dr. Greenhow examined at Birmingham, 15, though still at work, were suffering more or less from shortness of breath, cough, and expectoration,—some of them so severely as to be almost incapacitated for labour.*

Grinders and polishers of steel.

b.) In the manufacture of earthenware, the chief sufferers are the china-scourers and certain of the potters.

China-scourers and potters.

China-scourers remove loose flint-powder from the baked china; and in doing so (partly by brushing, partly by rubbing with sandpaper) they send much flint-dust into the atmosphere about them,—a dust, which is lighter and floats more obstinately in the air, in proportion as the earthenware is fine. This dust, inhaled into the lungs of the work-people, is a terrible irritant to the bronchial surface which it invades. The women (for the occupation is a female one) soon get habitual shortness of breath, with cough and expectoration; very often they have bleeding from the lungs, sometimes also from the nose; and their chronic disease is from time to time accelerated by more acute catarrhal attacks, to which they are particularly subject. Comparatively few china-scourers continue very long at the employment. All who continue at it become, sooner or later, "asthmatical."† Those who

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* Not many grinders suffering from the characteristic disease could be induced to submit to stethoscopic examination; but of those whom Dr. Greenhow examined at Sheffield he reports,—"Several were suffering from "chronic bronchitis, and others, in a more advanced stage of the disease, afforded "evidence of consolidation of the lungs. The cases examined were not suffi-"ciently numerous to determine the frequency of the latter condition, and the "only patients who, on examination, afforded evidence of the existence of "cavities in the lungs, were young men under 30 years of age."—J.S.

† "A scourer who had worked eight years, and was suffering from chronic bronchitis, said, that four other scourers who were employed in the same room had died from the effect of the occupation since she had commenced it, and that a fifth was then at the point of death. In a third pottery, a woman who had worked ten years at the occupation asserted, that about 12 other scourers in the same shop had died since she entered it. Out of 13 china scourers, belonging to six or seven different potteries, whose evidence was taken, only four were in good health; nine were suffering in consequence of their occupation. Of the latter, three were suffering from an advanced stage of chronic bronchitis, attended by great difficulty of breathing; four had suffered from hæmoptysis; and the others all had more or less shortness of breath, cough, and expectoration. The eldest of these women was 50 years of age, two were over 40, and four were under 30 years of age. One of the latter was among those whose health had given way under the employment."—J.S.

China-scourers and potters.

relinquish it in time are said occasionally to regain perfect health; but for the greater number the mischief is reported to be irretrievable. Against the danger of this occupation scarcely any provision has been made. In one of the potteries visited (says the inspector) "the china was placed upon a " small moveable turn-table, for the purpose of being scrubbed " with sandpaper, an arrangement by which the dust was " kept at a greater distance from the mouth of the scourer " than when held in the hand. In another pottery the " china was being rubbed within the opening of a sort of " canvas tube or windsail, up which a draught of air carried " a considerable portion of the lighter dust. In most potteries, however, no special precautions are employed to " prevent the dispersion of the flint-dust into the atmosphere."

Potters (including in this term all the various shapers of earthenware,—flat-pressers, hollow-ware-pressers, throwers, turners, and sagger-makers) are exposed in different degrees to the influence of a dusty atmosphere; all in a less degree than the china-scourers, but some of them, especially the flat-pressers, in a degree which is most injurious to health.* The mechanism of the nuisance to which they are exposed is this:—shavings of the potters' dough fall abundantly about the work-place; they rapidly dry upon the floor, more rapidly as the room is more hot; they are then easily convertible into powder; and this powder rises into the air of the room in proportion as the business there is one of much bustle and movement. How flat-pressers come to be especially sufferers by dust, and how, not only in their case, but in that of potters generally, the evil varies in amount, with varying arrangements of a work-place, may be illustrated by the following quotation:—"Articles made by flat-pressers " are sent, immediately, to dry in a closet or stove heated

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" * Out of 37 flat-pressers, taken indiscriminately in several potteries, 20 suffered habitually from bronchial irritation (or potters' asthma, as it is termed); and only 17, most of them younger men, declared themselves to be healthy; out of 16 hollowware-pressers, 8 only considered themselves healthy; the others were all suffering, more or less, from dyspnœa and cough. Out of 14 turners only 4, and out of 16 mould-makers, only two, were asthmatical."—J.S.

China-scourers and potters.

“ by a furnace. These stoves are placed in the workshop,
“ and frequently, especially among plate-makers, close to the
“ operatives, so that the atmosphere in which they work is
“ of an elevated temperature, and very dry. The ware is
“ carried into the stoves by boys, who are very young, and
“ are kept running to and fro all day, thereby filling the
“ atmosphere of the shops with dust. The quantity of dust
“ varies according to the cleanliness of the place. Some
“ workshops are swept daily, others only once a week, and
“ of course the operatives employed in the latter are more
“ exposed to inhale dust than those in the former. The
“ temperature of the workshops depends partly upon the
“ sufficiency of the supply of moulds. When the men are
“ well supplied with them, it is not necessary to hasten the
“ process of drying, and the stoves need not be so highly
“ heated. When, on the other hand, there is a deficiency of
“ moulds, the potters endeavour, by way of compensation, to
“ hasten the process of drying, in order that the moulds may
“ again be soon ready for use.”

c.) As regards textile manufactures, illustration may be taken from cotton-factories and flax-factories.

Cotton-carders.

In cotton-factories, the carding-rooms are by far the most njurious. They employ many operatives—sometimes even a third of the whole establishment. All employed in these rooms inhale a dusty atmosphere, with much cotton-fibre diffused in it. Some of them are exposed to special aggravations of the nuisance; the card-strippers, for instance, who remove adherent cotton from the carding-engine, and who during this process surround themselves with an extraordinary amount of dust; and still more the card-grinders, who, in the daily process of grinding the engines, share the liability of ordinary dry-grinders to inhale a metallic dust. The influence of the ordinary carding-room atmosphere on persons regularly employed in it is such, that, apparently, few carding-room operatives reach fifty years of age without having acquired an amount of chronic bronchitis which at no distant time disables them. Yet evidently the evil is in great part controllable. Partly, no doubt, it varies in degree according to the quality of cotton which is in work; but also it greatly varies

Cotton-carders. according to the arrangements of the work-place,—is lessened in proportion as the room is lofty and ventilated, in proportion as the carding-engines are closely covered, and in proportion as means are used to modify the more dust-producing processes. For example;—in some factories the carding-engines, when about to be ground, are taken out of the room; in some, the grinding is done by a machine which supersedes manual labour, and to a great extent saves the grinder from metallic dust; and in some there are carding-engines so constructed that with them no stripping process is necessary. Also, it was remarked by a manufacturer, that "a large proportion of the dust and flue which escape into the atmosphere "of the rooms might be intercepted and carried away by "means of properly constructed flues and fans, but that the "expense, both of the machinery, and of additional steam-"power to work it, is a barrier to their being employed."

Flax-workers. In flax-factories, the production of disease is terribly great. A very irritating dust, more or less abundant according to the quality of flax, is produced in the processes of hackling, carding, line-preparing and tow-spinning. The casual visitor who breathes this dust gets at once a sense of oppression at the chest; and the operative who habitually breathes it rarely attains mid-life without suffering more or less from bronchial disease. Of 107 operatives whose evidence was noted by Dr. Greenhow (operatives taken by him quite indiscriminately—young and old, well-looking and ill-looking—but all employed in more or less dusty departments of the manufacture) 79 were suffering or had suffered from the bronchial irritation; and in 19 of the 79 there had been hæmorrhage of the lungs—in some cases again and again. In certain of these dusty departments, the suffering is greater than in others:—hacklers, especially hand-hacklers suffer very greatly; among 27 of them whom Dr. Greenhow examined, 23 were diseased, and 5 had had hæmorrhage from the lungs. Many of the older operatives "are seen at a glance to be short-breathed; "the rounded shoulders, emaciated frames, prominent eyes, "and laborious wheezing respiration, all clearly show that "they suffer habitually from dyspnœa; indeed it is mar-"vellous to see men in the condition of some of the hand-

" hacklers still able to continue at their labour; a circumstance probably ascribable to the very slow and gradual " progress of the disease."

Flax-workers.

The effects of the dusty work-place are not confined to the lungs: often the stomach gets deranged by the quantity of swallowed dust; often ophthalmia (especially at the margin of the eyelids) is produced; often the voice becomes hoarse; and sometimes there is bleeding from the nose. Not a few operatives desert the occupation in consequence of the misery it occasions them: but new sufferers succeed; and many get a certain degree of acclimatization, with which they go on, patiently bearing the gradual progress of disease, till presently, in mid-life, or soon afterwards, their employment brings them to helplessness or death.

In flax-factories, as in cotton-factories, the fatal nuisance of dust is, to no small extent, controllable. Not only will it be greatly affected by the general ventilation of the work-place, but machines may be so covered as to prevent much dispersion of dust from them, and ventilating flues may be so arranged that dust is drawn away almost in the moment of its production. In some cases the inspector saw appliances of this kind in operation. But in other factories, says his report,—"either no means at all, or very inadequate means, " are employed for preventing the dispersion of dust into the " atmosphere, and, of course, the operatives suffer in consequence of this inattention of the master.

Miners.

d.) In our mining industry there is only one broad exception to the rule, that miners, as a class, break down prematurely with lung-disease. That exception is of signal importance; so also are some minor differences of degree which may be named; and to these I will directly return. But first, with regard to that which unhappily is the rule,—what are the circumstances under which the miner's lung-disease is contracted?

The miner, like the indoor operative, often spends his day in an ill-ventilated work-place. But the non-ventilation from which he suffers is associated, in its existence and its consequences, with conditions special to the subterranean employment, and far more complex than those which belong

Miners.

to the non-ventilation of common work-places. The air in which he works is air which for his safety's sake ought pre-eminently to be ventilated; for in most cases, not only the exhalations of human labour, but gases indigenous of the mined earth, or gases from gunpowder burnt in rock-blasting, tend incessantly to gather round him at his work, as an atmosphere quite unfit for respiration. Nor is it always only on that account that ventilation is important to the miner; for against the dust and smoke which abound in many mining operations, against the heat which in deep mines grows with every considerable descent, and against the terrible danger of fire-damp, ventilation is the one possible corrective. The air in ill-ventilated mines must be very greatly more impure than the air of ill-ventilated above-ground places. So considerable must be its defect of oxygen, so considerable its excess of carbonic acid, that, not only must it be insufficient, often almost urgently insufficient, for healthy respiration, but in many cases, I apprehend, must interpose an appreciable physical obstacle to the free circulation of blood through the lungs. And the same air, besides being chemically insufficient for respiration, also carries with it into the miner's lungs more or less irritant material,—material, which, though the air were ever so well oxygenated, would itself tend to produce bronchitis—grit, namely, and soot and the acid fumes of combustion. The miner, meanwhile, is not at sedentary employment, like many indoor operatives, but is doing arduous muscular work for many consecutive hours,—work which claims full service from all his apparatus of respiration.

When, on the one hand, it is considered how very hurtful to the lungs must be the atmosphere of an ill-ventilated mine, and when, on the other hand, it is considered that, without much expenditure of skill and money, the ventilation of mines is not possible, nor even with such expenditure always easy,—there could be no wonder though the miner almost invariably got lung-disease. And in fact, under the too common circumstances of the employment, his health-history is this:—that even at an early age the respiratory mucous membrane begins to suffer; that for a time there

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may be only hoarseness or wheezing, or slight oppression at the chest; that shortness of breath, cough and expectoration succeed, and gradually become habitual—the expectoration of course being characterised by an admixture of whatever dust or soot has entered and is irritating the lungs; that, if there be personal predisposition to tubercular phthisis, this disease very early develops itself; that, barring phthisis, the bronchitis goes on, probably often with more or less superaddition of pneumonia, and sometimes with the complication of emphysema; that the sufferer becomes very susceptible of acute catarrh, which, with successive attacks, rivets more and more closely the hold of the chronic disease, and aggravates at last, often to a fatal amount, the urgency of its previous symptoms; that presently the ordinary complications of long-continued bronchitis arise—heart-disease (which perhaps is in some cases specially promoted by special circumstances in the occupation) and, with heart-disease, various dropsical symptoms.

Happily, as I have observed, to run this painful course is not indiscriminately the law of mining existence. One class of miners—that of the Northumberland and Durham colliers, forms a striking exception. So far as existing mortuary statistics enable a judgment to be formed, these miners, as compared with other classes of the community, do not suffer any important excess either of pulmonary or of other disease; and, were it not for the chances of violent death which surround them, their employment might be deemed fully compatible with an average expectation of life. On the other hand, the rule, to which these colliers are the exception, —the rule, that employment in mines causes pulmonary disease, and leads to premature disablement and death, is illustrated in the mortuary statistics of Redruth, Penzance, Abergavenny, Merthyr Tydfil, Wolverhampton, Alston, Reeth and Pateley Bridge, and in the facts which their Lordships' inquiry has elicited with regard to the sanitary state of the mining populations in those places respectively; though, again, even among these suffering populations, the pressure of pulmonary disease varies not inconsiderably in its amount.

Miners.

The healthiness of the northern coal-miners, and the lesser degrees of suffering among some of our other miners, correspond to the different degrees of ventilation in the mines where those miners are engaged. In the northern coal-mines good ventilation is the rule; in the copper-mines and tin-mines of Cornwall, in the lead-mines of Reeth, Alston and Pateley Bridge, and in the iron-mines and coal-mines of Wolverhampton, Abergavenny and Merthyr Tydfil, good ventilation is the exception. Yet even with regard to the latter classes of mines testimony is borne to the effects of relatively good ventilation; not only as evidence that in recent times ventilation has almost universally been improved, and therewith the miner's occupation been made less fatal to him; but likewise as evidence on the comparative ventilation and comparative unwholesomeness of mines.

Thus, among the Welsh miners, it was said that "in some mines the smoke [of gunpowder-blasting] is rapidly carried away by the ventilating current, while in others it lingers for a long time. It was distinctly stated of one mine, that the smoke is swept away from the face of the work, where the men are most exposed to inhale it, in a few minutes after the explosion, whilst the atmosphere of other mines was said to be scarcely ever free from smoke, which only disappeared by what the miners expressively call 'dying away.' The miners employed in the former were reported, by the manager, the surgeon, the overman, and by some of the men themselves, to be nearly exempt from miner's asthma; while it was ascertained of some of the latter, that almost all the men become asthmatical as they advance in life. These are, indeed, extreme cases, the one being the best and the others probably among the worst ventilated mines in the district; but there are also other mines of every intermediate variety as regards the efficiency of their ventilation."

Thus, again, in the Wolverhampton district (where there was much difference in the ventilation of mines) evidence was repeatedly given,—that the men suffer in proportion to the dust and powder-smoke diffused through the atmosphere of the mine,—that this depends on the greater or less inefficiency of the ventilation,—that the well-ventilated mines are much less injurious to health than such as are ill-ventilated.

Miners.

And equally, among the lead-miners, evidence to the same effect was given; evidence which is the more important because they, of all miners, are probably the most suffering class. Differences indeed were spoken of, dependent on geological circumstances of the mine,—that mines in some strata would be dustier than mines in other strata; and no doubt this is the case. But the great difference was the difference of ventilation,—a difference which of course makes itself more felt in proportion to the dustiness and other impurity of the mine. As it was better or worse, the miner's time for disablement varied. In one mine which was visited, all the men, it was stated, became short breathed before the age of forty; while in another mine, few, it was said, suffered materially till after fifty. And in other like ways it made itself obvious in its effects:—"Men who have "previously shown themselves but slightly affected, being "thereby less able to resist the deleterious influences attendant on mining than men in health, often break down "rapidly on being removed to a 'wind-less,' that is an ill-"ventilated place of work. On the other hand, timely "removal to a better situation often proves an effectual "means of checking the progress of the complaint. Several "lead-miners who, feeling their health injured by their "occupation, had either worked for a time at coal-mining, "or at some employment on the surface of the earth, "asserted that they had by this means very much mitigated "their ailments, some of them having subsequently been "able to resume their original occupation."

Unwholesome circumstances of domestic manufactures.

e.) With reference to the unwholesome circumstances under which domestic manufactures are commonly carried on, the cases of the straw-plaiters at Berkhampstead and Tring, of the glove-makers at Yeovil, of the lace-makers at Towcester and Newport Pagnell, and of many silk-operatives at Leek, seem to me deserving of particular attention; the more so, because women and children—in some cases very young children—are the principal sufferers in these manufactures.

Detailed information as to these branches of industry is in the Appendix of my last year's report; but it will be convenient to quote here some passages on the subject.

Straw-plaiters.

At Berkhampstead and Tring women and children are engaged in straw-plaiting. "The manufacture is carried on "at home . . . . . The cottages of the labouring classes "in Berkhampstead are usually small, ill-ventilated, and "very frequently dirty; this applies more particularly to "the modern houses, which are worse constructed and worse "ventilated than the older ones . . . . . The cottages of Tring "are, upon the whole, larger and better than those of "Berkhampstead . . . . . Even these larger dwellings are some- "times too small for the number of their inmates . . . . . "Young and even married women, when they are able to "do so, work from 10 to 14 and sometimes even to 15 hours "a day; the average certainly being 12 hours." Except in fine weather, when the doors of the cottages are kept open, and the women sometimes sit in the open air, or walk about at work, these long hours are devoted to a sedentary occupation in badly ventilated cottages of very limited dimensions. "Children begin to learn the manufacture of straw-plait "very early; often at four years of age. In the first "instance they are generally taught by their mothers; but "at about five years of age, and sometimes even sooner, "they are sent to the plaiting schools, where each child has "an allotted task to perform during the day. The work at "these schools is done on behalf of the mothers, who provide "the straw, and fix the amount of plait which their children "are expected to make during the day, paying the school- "mistress a certain sum per week for her superintendence. "The hours of attendance at these schools are long [by "rule 8 to 9½ hours; but liable to be prolonged for children "who have not done their allotted task]; and the schools "are held in rooms almost invariably over-crowded, the "atmosphere of which must in winter be much impaired by "the respiration of so many persons."

Glove-makers.

At Yeovil "the manufacture of gloves is chiefly carried on "in the dwellings of the industrial classes. The rooms are "frequently small, low, and deficient in ventilation; the

Glove-makers.

" cottages often having neither back doors nor back win-
" dows..... The domestic branch of the glove manufacture
" is almost exclusively carried on by women and girls, who
" work in the small, ill-ventilated rooms of their cottages,
" and sit very close at their employment during many hours
" of the day. It is said that sometimes when work is very
" pressing they devote as many as sixteen hours a day to
" their labour; but it was established without doubt that
" they commonly work 12 or 13 and frequently 14 hours out
" of the 24. Indeed it was plainly stated by some of the
" more intelligent women, that female glovers who have to
" earn their own maintenance must work very diligently and
" sit very closely to their labour. The occupation is entirely
" of a sedentary nature, and the women sitting upon low
" seats constantly stoop much over their work, which is fixed
" in an upright stand called an engine..... The women
" engaged in the manufacture of gloves in their own homes
" rarely go out of doors..... Young girls begin the business
" of glove-making sometimes as early as the age of seven, but
" commonly at that of eight or nine years. It is usual
" for mothers to set their children a certain amount of
" task-work, which must be completed before the close of
" the day."

Lace-makers.

At Towcester and Newport Pagnell the female population is largely engaged in lace-making, "which is in both places a
" domestic occupation..... The dwellings of the labouring
" classes both in Towcester and Newport Pagnell are often
" very small, over-crowded, and ill-ventilated. Many of them
" being without back doors or windows, do not possess the
" means of thorough ventilation. The bed-rooms are often
" entered one through the other, and in many instances there
" is no chimney in either of the sleeping apartments ...
" Even in many of the cottages of larger dimensions the
" internal atmosphere is stagnant at night, owing to the
" absence of chimneys, or to the fact of their being closed up
" to exclude draughts of air. Such rooms always have a
" close, stifling smell to strangers coming from the open air,
" even though they be sufficiently capacious..... The women
" employed in the manufacture of lace-work for 9, 10, or 12

Lace-makers.

“ hours per day, and occasionally even longer. The work is
“ done in the cottages during the greater portion of the
“ year .... During the winter, when the women work entirely
“ within doors, every crevice or chink through which
“ a draught of air could find entrance is carefully stopped.
“ The women are said very rarely to leave the immediate
“ vicinity of their dwellings, and to take but little exercise
“ in the open air, and that for the most part late in the
“ evening, regardless of weather, and often very imperfectly
“ clad. The inmates of neighbouring cottages sometimes
“ assemble in the same room to work in company, particularly
“ at night, when artificial light is required, a single
“ candle thus serving for several workers, each of whom has
“ a globe filled with water, supported on a wooden stand,
“ placed between the candle and her work, upon which it
“ concentrates the light .... Their sedentary mode of life
“ renders the women liable to suffer from cold feet in the
“ winter season; to obviate which annoyance many of them
“ are accustomed to place a sort of chafing dish, filled with
“ embers from the fire, or, it was said, with ignited charcoal,
“ beneath their dress, a practice which, of course, tends to
“ vitiate the atmosphere of their small ill-ventilated cottages.
“ Children are, if possible, even more exposed than adults to
“ some of the pernicious influences attendant upon the occupation
“ of lace-making. Girls begin the work as early as,
“ and sometimes earlier than, seven years of age. Partly for
“ the purpose of learning the business, but chiefly in order to
“ be under the superintendence of a mistress, they are usually
“ sent to a lace school, where they are expected to make a
“ given amount of lace in the course of a day. The hours of
“ attendance in these schools vary somewhat, according to
“ the age of the children, and the custom of the place.....
“ From eight to ten hours per day appears to be the more
“ usual duration of labour in these schools both in Towcester
“ and Newport Pagnall. As in the plaiting schools, so here
“ likewise, the children must complete their appointed task
“ before leaving, and, failing to do this, are detained until it
“ is finished. The schools are held in ordinary cottages, and
“ are often much overcrowded..... From the position which

Lace-makers.

they occupy while at work, the children employed in this trade very soon become round shouldered and narrow chested. . . . . Lace is made upon circular pillows or cushions, stuffed with straw which rest at one side upon a sort of wooden frame, and at the other upon the knees of the worker, who [except where a special contrivance is used] is thus compelled to maintain a more or less constrained position. . . . . The cushions are usually placed so low that the worker is compelled to stoop over her work, and the arms being habitually brought forward, in order to enable the women to handle the bobbins, lacemakers are apt to become round-shouldered, and, their chests being contracted, the act of respiration, particularly when the cushion rests on the knee, is not freely and efficiently performed."

Silk-workers.

In Leek, exclusively of persons employed in silk-mills under the Factory Act, "a great number of very young children, from eight years of age upwards, work at home, or in winding-rooms, or other work-places, which do not come within the jurisdiction of the inspectors. In some of these places children are employed to turn the wheel that moves the machine, an employment at which they are engaged for at least 10 hours in the day. Thus, in a thread manufactory 24 women and girls were employed in the winding-room at the time of visit. The wheels that moved the winding machines were turned by two boys, of the respective ages of 8 and 9 years. Probably it would not pay to employ steam-power in so small an establishment; but its absence enables the proprietors of these small factories to escape the restrictions imposed by the Factory Act. About 21 persons were employed in another small winding establishment. The wheel was here turned by a man; but 10 little girls, some of them not more than 8 or 9 years of age, and only one or two as old as 11, were working 10 hours a day. In a third establishment of the same kind, 18 or 20 of the operatives were girls between the ages of 8 and 12 years. Including men, women, and children, 51 operatives were here crowded into a space which, including that occupied by machinery, consisted of 10,000 cubic feet, thus affording an average of less than 200 cubic feet per head. The machines

Silk-workers.

were moved by a wheel turned by a man; ventilation was most imperfect; in fact, practically, there was none, for the windows opened so exactly in a line with the heads of the workers, that they could not bear them open while at work. The duration of labour was 10 hours per day. There are many other work-places of the same kind in Leek, in each of which from five or six to a dozen persons are employed; but most of these places may be regarded as rather in the light of domestic work-rooms than of factories. . . . . Both weavers and 'piecers' (*i.e.* the women and children who tie together the ends of silk which breaks while winding from the 'swifts' on to the bobbins) work in a constrained position. Silk-weavers sit at their looms, with the body leaning forwards, and the lower part of the chest firmly pressed against the wooden beam on which their work is rolled, thus compressing both the stomach and chest; their arms are habitually brought forwards while at work, and they are thus apt to become round-shouldered and narrow-chested. . . . . Weavers, like many other operatives, are liable to suffer from working in close, ill-ventilated work-places, either in factories or at their own homes. . . . . Piecers, and especially children, besides often working in badly ventilated rooms, stoop much at their work. They work in a standing position, and have a certain amount of exercise in moving backwards and forwards along the frame for the purpose of tying the broken ends, but in doing this they usually have occasion to stoop forwards. The precise influence of this position cannot be accurately estimated, seeing that it is associated with working in close, ill-ventilated rooms; but piecers appear from the death register to contribute an undue proportion of the mortality from pulmonary diseases. Much of the work on which piecers are employed is done at home, or in winding shops, not worked by steam power, and, in this case children of both sexes, but principally girls, are employed irrespective of the restrictions either as regards hours of labour or the age at which they are put to work, imposed by the Factory Act. . . . . The deaths of young girls employed in the silk manufacture have been very numerous in both Macclesfield and

Silk-workers.

" Leek; but there are no accessible data from which to cal-
" culate the proportion their deaths bear to those of the rest
" of the population of the same age and sex. . . . . The sleeping
" apartments in the cottages at Leek are frequently destitute
" of chimneys, and the windows, opening but imperfectly,
" their ventilation is most inadequate; and yet, upon the
" whole, the dwellings of the labouring class are superior to
" those in many agricultural districts."

Preventability of industrial lung-disease.

(iv.) With regard to the all important question—whether it be possible, without impeding the proper march of industry, to reduce those great attendant evils which their Lordships' inquiry has demonstrated,—I am happy to say that the inspector's reports teem with statements which justify, for many of the occupations, a decidedly affirmative answer, and for the other occupations at least a very hopeful opinion.

That, where domestic manufacture is concerned, the domestic ventilation might be amended, and the domestic crowding be restricted, may, I suppose, be taken as self-evident. And that the employment of children in certain of these manufactures might be so amended in its conditions, as no longer to be almost cruel in amount and unwholesomeness, is also evidently an attainable improvement. That where factory-work is concerned, the factory ventilation might be amended, and factory crowding be restricted, is shown by the many contrasts of good and bad which abound in the inspector's reports,—contrasts between factories in any one given place and devoted to any one given industry,—contrasts which show a well-ventilated and comparatively wholesome factory side by side with one which may even stink with the exhalations of its inmates.

That the bronchitis-producing influences special to particular branches of industry, may also, without detriment to the respective industry, be largely reduced or abolished, is shown by similar evidence. There are the contrasts of good and bad, the differences of bad and worse, to which I have adverted in speaking of the particular occupations. In mining, for instance, there is the comparative perfection of the north-country coal-mines to point to; and there are the differences, Preventability of industrial lung-disease.

well known in their respective districts, between well-ventilated and ill-ventilated mines (whether copper-mines or lead-mines or tin-mines or iron-mines or coal-mines) in Wolverhampton, Abergavenny, Merthyr Tydfil, Penzance, Redruth, Pateley Bridge and Reeth. Similarly, in hackling-rooms, grinding establishments and the like, there are cases where the injurious influence is left at its maximum; others where it is considerably controlled. So again in the slip-making department of potteries, there is at least one case (that of Messrs. Copeland's establishment) where the injurious process of slip-boiling is dispensed with, in favour of another process which inflicts no injury on the workpeople.*

Why are preventive measures against industrial lung diseases not adopted?

(v.) Why, then, it may well be asked, do the various possible improvements, which would save so much human life and prevent so very much human suffering, remain, comparatively speaking, unadopted?

The sources from which reform could be initiated are three:—the voluntary action of employers of labour;—the demands and insistence of work-people; the coercion of law;—and respecting each of these, separately, something explanatory must be said.

First, as regards the employers of labour, they, in many instances, have given ample proof of good-will:—in every one of the injurious occupations, different establishments present different degrees of injuriousness; and, in those establishments where the better conditions exist, this superiority denotes that means of improvement have been voluntarily adopted by enlightened and kind-hearted employers. On the other hand, in many instances, the employer seems not to have given any thought whatever to the matter—seems to be unconscious of any particular responsibility in regard of it—seems not to know, or for practical purposes, not to care, that he makes his commercial profits with an unjust and wasteful consumption of his neighbour's life. Again, in a considerable number of intermediate cases the employer has attempted to mitigate the unwholesome influences under which his work-people are suffering, and has failed through want of knowledge, as especially in the many unskilful endeavours which have been made to amend the ventilation of work rooms.

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* It deserves notice that the extreme subdivision of labour, which marks our highly artificial system of manufacturing industry, is specially apt to illustrate the hurtfulness of particular industrial processes. Where only some small part of a manufacturing process is directly hurtful in its nature, the hurtfulness of that part might easily escape observation, or indeed might practically be of little importance, if every workman in the factory took his turn of it, as of other parts of the manufacture, and thus had for his share but a small exposure to the influence. But, under our existing organization of labour, the china-scourer is always china-scourer, the flax-hackler always flax-hackler, the steel-grinder always steel-grinder; and thus the evil effect of the occupation goes on accumulating in the individual. *See* also footnote at p. 64.—J.S.

Secondly, as regards the work-people themselves, it is true that in a certain sense the matter is in their hands,—that they might rebel against needlessly unwholesome conditions of labour—might refuse to work in places where there is not reasonable care for their lives. But this theoretical power of the workman is in present practice a nullity. He cannot exact his sanitary rights. He could not do so unless he were one in a combination of claimants; nor even then unless, further, he had sufficient knowledge to shape demands for definite remedies. These conditions do not seem in any degree likely to be realised. Indeed, except with the most notorious occupational diseases, the workman seems but partially aware of the fatal circumstances under which he labours. The steel-grinder knows the cause of his "rot," and the potter or miner the cause of his "asthma;" but the many indoor operatives who contract phthisis through unwholesome conditions of labour are probably ignorant of the danger they incur. Even where the mischief is most flagrant, the workman sometimes has a short-sighted hesitation about the remedy—is apprehensive, lest, if his occupation were made harmless to him, his weekly wages would be made smaller. And especially he is jealous of new introductions of machinery, which in some cases might supersede hurtful processes of hand-labour. Then, too, the progress of disease is slow,—phthisis scarcely making itself felt till it has stealthily got an irresoluble hold on life—bronchitis a mere nothing for years, till gradually, very gradually, it grows to the pitch of chronic suffocation; both diseases, so small at first—so insidious; and the beginning artisan young and careless; and death far in the distance. Doubtless there are very many instances where an individual artisan seeks work by preference in the more wholesomely conducted establishments of his business; and in cases where personal precaution counts for something, the individual workman is here and there found taking care of himself; but the inquiry has shown little of this kind of influence operating on compact masses of workmen. And it must be remembered that, among those who suffer from unwholesome industrial conditions, many defenceless persons are found,—many women, many mere boys and girls, many children.

Thirdly, as regards the intervention of any legally constituted authority,—no existing law is more than very imperfectly applicable to procure the mitigation of unwholesome industrial conditions.

Defects of ventilation are, in theory, dealt with under the Nuisances Removal Act; for, under that act, Justices can order proper means to be taken (and among such means "ventilation" is expressly included) for the abatement of any condition which is *injurious to health*[*] in any "messuages, lands, or tenements, whether open or enclosed, whether built on or not, and whether public or private;"[†] and consequently it is part of the responsibility of local authorities under the Act (and it also lies within the competence of individual complainants[‡]) to move Justices to enforce the ventilation of work-places, wherever non-ventilation is demonstrably injurious to health. But, in practice, these powers are hitherto almost unapplied; partly because the magnitude of the evil is but most imperfectly appreciated, either by local authorities and justices, or by the slowly suffering artisans themselves; and perhaps still more—at least in regard of factories, for another reason. In any proceedings under the Nuisances Removal Acts, an official complainant should be ready to state in precise terms what remedy he asks the justices to apply. Now, in order to prescribe suitable ventilation for a work-place, there must be used a fair amount of intelligence and discrimination. The fittest means of cure are often not obvious to an unskilled person, nor uniform for all cases; and with ill-adapted ventilation there may be as much immediate annoyance as with non-ventilation. An average inspector of nuisances cannot dictate ventilation off hand, as he would direct the clearance of a dust-bin. Justices, acting without skilled advice, cannot themselves order in detail particular means of ventilation; nor could they reasonably order in general terms "that " ventilation be provided to the satisfaction of the local " authority," unless evidently this authority were acting with skilled advice. Thus, it seems, the evil is left unabated, lest perhaps any offered remedy should be worse than it;—much of the evidence painfully showing, that, where sometimes good intentions have been at work, they have commonly frustrated themselves through want of knowledge,—that, again and again, where a work-place has had inlets advisedly made for ventilation, these have been made with so little judgment that the work-people could not suffer them to continue.

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[*] *See* definition of nuisance in Section 8 of the Act 18 & 19 Vict. c. 121.—J.S.

[†] *See* Section 2 of the just recited Act.—J.S.

[‡] *Sec* 23 & 24 Vict. c. 77. § 13.—J.S.

Against the other sources of industrial disease to which the report has referred, no law yet pretends to make provision.

Thus, almost without exception, the sanitary circumstances of labour are left to take their chance of such improvement as the employer may be willing to offer, or the employed be able to exact. How partial, how imperfect, are the improvements thus realized, the submitted evidence abundantly shows. And how ineffectual they are to prevent the wasteful consumption of life, is shown by those sad statistics from which the investigation commenced.

No present prospect of much improvement.

(vi.) Practically, it seems certain that an indefinitely long time must elapse before better results can be brought about by the agencies which are now in operation; and that, year after year, as far forward as any present judgment would willingly speculate, the same terrible waste of adult life must, with no great mitigation, continue, unless the Legislature see fit to provide, by special enactment, for more wholesome conditions of labour.

The suggestions, which, in this point of view, I would beg leave to submit for consideration are the three following :—

Questions which the evidence suggests with regard to amendatory legislation.

First,—industrial establishments, in their relation to the convenience and health of persons in whose neighbourhood they stand, are already subject to the Nuisances Removal Act. If it be duly certified that nuisance is caused by effluvia from "any manufactory, building, or place used for any trade, "business, process, or manufacture," and that the person by or in whose behalf the work is carried on has "not used the "best practicable means for abating such nuisance, or pre-"venting or counteracting such effluvia," the local Justices, moved either by the local authority under the Act, or by any inhabitant of the place, may enforce a penalty which increases with each successive conviction :—but subject to these restrictions ;—first, that Justices may suspend judgment, on condition that the person complained against undertakes to adopt, within reasonable time, such means as they judge practicable and order to be carried into effect for abating the nuisance; secondly, that the person complained against may appeal to Quarter Sessions, and this court may, if it see fit, cause the case to be removed for determination to the Court of Queen's Bench; thirdly, that the penalty (which on a first offence is 40*s.* and increases with each subsequent offence) shall not in any case be increased beyond the sum of 200*l.* Is there any sufficient reason why industrial establishments, in their relation to the health of persons labouring in them, should not be made subject to the spirit of this enactment? It would indeed be unreasonable to expect unconditionally that a mine should be perfectly ventilated, or flax-hackling be perfectly without dust; but it would not be unreasonable to require, and it would seem quite indefensible to refuse, that, in these and like cases where masses of industrious life are jeopardised, the employer of labour should use *the best practicable means* to protect his labourer from harm.

Secondly,—certain industrial establishments are subject to Government inspection, and some, to a very limited extent, are regulated by Act of Parliament. Factories which have steam-engines or water-power, and also bleaching and dyeing works, are inspected in the interests of those who work in them; so likewise are coal-mines and iron-mines. Is there any sufficient reason why these precedents should not be followed with other industrial establishments,—followed at least wherever there is proof that life is endangered by the occupation? There is cruel overwork* of women and children in premises which have not the steam-engine or water-power qualification to be inspected. There is abundant causation of premature death in mines which are neither coal-mines nor iron-mines. And potters, grinders, carders, hacklers, not to mention hosts of other artisans, may, any of them, show the same claim as miners—the claim of grievous physical suffering—to have the special circumstances of their industry subjected to Government superintendence.

Thirdly,—in the above-cited cases, where Government inspection is made, the inspector, if he finds things wrongly or illegally done, sets in motion whatever means the special law under which he acts has provided for procuring correction or redress. Is there any sufficient reason why the inspector's power of thus proceeding should not be extended to common sanitary faults in whatever work-place he inspects,—why, for instance, the factory-inspector should not be authorized to move Justices to order amendments of ventilation for a factory? The unboxed machinery, against which he now has authority to move the magistrate for penalties, is indeed a real danger to life and limb; but even though every mutilation which results from it were to be counted as a death, the deaths from unboxed machinery would probably count as nothing in comparison with those which the unventilatedness of factories occasions. And a skilled inspector's intervention would supply the one condition which is hitherto absent, for getting the Nuisances Removal Act applied to the lessening of that gigantic evil.

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* In this report I have said little of over-work in itself; nor is any useful object to be gained by considering at present what might be a proper duration of daily labour if all the industrial circumstances were good. Those circumstances being what they are, "work" in the inspected occupations has almost universally been found to be "over-work"; and in some cases the duration of work has been such as, under the best conceivable industrial circumstances, would have been monstrous. Where any branch of industry is (either naturally or through adventitious circumstances) insalubrious, the injury to health of course increases with the extension of hours of labour; and accordingly, in proportion as any labour includes in itself special conditions against life, so, if life is to be cared for, the work-day of the particular occupation, as compared with the work-days of healthy occupations, ought to be of short duration. *See* also preceding foot-note, p. 48.—J.S.

In respectfully submitting these suggestions, I will venture to express my belief that if they were deemed fit for acceptance, and were practically carried into effect, the resulting gain would be among the very amplest which a Legislature can hope to realise through the application of preventive medicine. For the canker of industrial diseases gnaws at the very root of our national strength. The sufferers are not few or insignificant. They are the bread-winners for at least a third part of our population. Their struggle, at best, is not an easy one. That they have it made needlessly hard and painful for them, dignified while it is by their infinite patience and courage and mutual helpfulness,—that men and women, while at work for children and parents, have causes of disease indolently left to blight them amid their toil, and to drag them down from the independence which they cherish, is surely an intolerable wrong. And to be able to redress that wrong is perhaps among the greatest opportunities for good which human institutions can afford.

2. *Excessive Mortality of Infants in some Manufacturing Places.*

Infantine mortality.

The remaining inquiry ordered by their Lordships during the year 1861—an inquiry into the sanitary circumstances of the infantine population in certain centres of industry, has grounds of interest almost identical with those of the last-mentioned inquiry.

In my report of 1858, practically an introduction to the annual reports which I have now the honour of submitting to the Privy Council, I drew attention to the fact that in different districts of England there are enormous differences of INFANTINE MORTALITY,—such differences that children in

Infantine mortality.

some districts die at perhaps four or five times the rate of children in other districts; and I stated my belief that these wide differences of death-rate are "due to the varying "prevalence of two local causes:—

"first, to differences of degree in *common sanitary defects* "of residence; some places abounding more than others "in the foul air and foul water of undrained, unpaved, "unscavenged, unwashed, unlighted, unventilated, localities "and houses;—

"and secondly, to *occupational differences* among the "inhabitants; there being certain large towns where women "are greatly engaged in branches of industry away from "home; where, consequently, the home is ill kept; where "the children are little looked after; and where infants "who should be at the breast are improperly fed or starved, "or have their cries of hunger and distress quieted by those "various fatal opiates which are in such request at the "centres of our manufacturing industry."*

The inquiry now reported on was especially intended to throw light on the second of the just-mentioned influences. Dr. Greenhow, whom under their Lordships' orders I instructed to make it, combined with his inquiry into industrial diseases at Coventry, Nottingham, Blackburn, Birmingham, Wolverhampton, Merthyr Tydfil, and Abergavenny, an inquiry into the circumstances of infant life in the same places respectively. His report is subjoined. It gives a very sad picture of suffering and demoralization, caused by the present circumstances of female employment in factories. It corroborates very exactly the opinion above expressed as to the probable causes of the high mortality of infants in places of female factory occupation. And it shows that while the infants perish under the neglect and mismanagement which their mothers' occupation implies, the mothers become to a grievous extent denaturalised towards their offspring.

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* *See* the above reprinted "Papers relating to the Sanitary State of the People of England," Vol. I., p. 469.—J.S.

Infantine mortality.

The following quotations tell the main facts of the case:—
"Factory women* soon return to labour after their confinement. The longest time mentioned as the average period of their absence from work in consequence of child-bearing was five or six weeks; many women amongst the highest class of operatives in Birmingham acknowledged to having generally returned to work at the expiration of a month; and it was stated by several medical men of great experience, and by other witnesses in Coventry and Blackburn, that the factory women even sometimes return to work as early as eight or ten days or a fortnight after their confinement...... Mothers employed in factories are, save during the dinner-hour, absent from home all day long, and the care of their infants during their absence is entrusted either to young children, to hired nurse-girls, sometimes not more than eight or ten years of age, or perhaps more commonly to elderly women, who eke out a livelihood by taking infants to nurse. Young girls, aged seven or eight years, are frequently removed from school for the purpose of taking charge of younger children while the mother is absent at work, and are sometimes said to return, on the death of the child, evidently rather pleased that this event has released them from their toil.... Children left by their mothers during so great a

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* "The contrast between the treatment of infants by their mothers in Merthyr Tydfil and Abergavenny and in the factory towns was most remarkable. The mortality among young children in these Welsh districts is said by the local medical practitoners to be much augmented by mismanagement, more especially by exposure to inclement weather and by improper feeding; but these habits proceed from ignorance, and not from neglect, the mothers, for the most part, being devotedly attached to their offspring. The houses are kept very hot within doors by means of large fires, and the mothers are accustomed to carry their children about with them wherever they go. Even children suffering from bronchitis, which is very prevalent in this bleak region, are habitually carried from the hot air within the house into the cold external atmosphere, whenever the mother has occasion to go out of doors. Another cause of infantile illness, and especially of convulsions, which occasions a large mortality in some of the Welsh districts, was said to be the custom of covering infants entirely over when laid in a cradle or bed. The air breathed by the infant while asleep is on this account imperfectly changed, and this may perhaps be one cause of the great prevalence of nervous diseases among the children of these districts."—J.S.

Infantine mortality.

" part of the day are fed in their absence on artificial food, " which is for the most part unsuited to their digestive " powers. The children are thus almost entirely spoon-fed, " the mother being able to nurse them only at night, perhaps " hastily early in the morning before setting out for the mill, " again at dinner-time, and no more until evening. . . . Pap, " made of bread and water, and sweetened with sugar or " treacle, is the sort of nourishment usually given during the " mother's absence, even to infants of a very tender age, and " in several instances, little children, not more than 6 or 7 " years old, were seen preparing and feeding babies with this " food, which in such cases consisted only of lumps of bread " floating in sweetened water. . . . . Illness is the natural " consequence of this unnatural mode of feeding infants. " . . . . Children who are healthy at birth rapidly dwindle " under this system of mismanagement, fall into bad health, " and become uneasy, restless, and fractious. To remedy " the illness caused by mismanagement, various domestic " medicines are administered, more particularly some kind " of opiate, such as Godfrey's cordial, or laudanum. Wine, " gin, peppermint, and other stimulants are likewise often " given, for the purpose, as alleged, of relieving flatulence, their " actual effect being, however, rather to stupify the child. " The quantity of opiates sold for the purpose of being ad- " ministered to infants in some of the manufacturing towns " is very large. . . . Women when remonstrated with on the " subject of drugging their children with laudanum, say that " they must keep their infants quiet, as their husbands and " elder children, who have to work during the day, cannot " do so if disturbed at night. Besides that sold by regular " druggists, much opiate is also sold in most manufacturing " towns by grocers and small shopkeepers, and a considerable " quantity by druggists under other names, such as 'Infants' " Bottle,' &c. Indeed there seems to be no doubt that the " habitual administering of opiates to infants must be " included among the causes of a high infantile mortality in " certain manufacturing towns not only on account of an " over-dose being occasionally given, but also because infants " kept in a state of continual narcotism will be thereby

Infantine mortality.

"rendered disinclined for food, and be but imperfectly "nourished. . . . . Parents who thus entrust the management "of their infants so largely to strangers become more or less "careless and indifferent about them, and as many of these "children die the mothers become familiarised with the fact, "and speak of the deaths of their children with a degree of "nonchalance rarely met with among women who devote "themselves mainly to the care of their offspring. Without "entirely concurring in the opinion expressed by several "persons in Nottingham, that child murder is common in that "town, it may yet be affirmed without hesitation, from the "facts brought to light during this inquiry, that a greater "degree of indifference is manifested towards their children "by the female operatives of manufacturing towns than is "found to be the case elsewhere. . . . Abundant proof of the "large mortality among the children of female factory operatives was obtained during the inquiry. An operative of "the better class in Birmingham reported that he collects "money for the expenses attendant on the deaths of children "among the workers in a factory where 150 women are "employed, and that he believed 10 out of every 12 children "born to the married women in this factory die within a "few months after birth. Many married women were "questioned, as opportunity served, in the several factories "visited, regarding their families, the number of children "they had borne, the number that survived, and the manner "in which they were brought up. The evidence of these "women tallied exactly with that of other persons. . . . . It "was frequently found that two-thirds or three-fourths of "the children born to these women had died in infancy."

It is scarcely necessary to observe, that against this state of things, there is no resource in any present provisions of law. And the root of the evil is an influence with which English law has never professed to deal. Money is on one side; penury on the other. Domestic obligation is outbidden in the labour-market; and the poor factory-woman, who meant only to sell that honest industry of hers, gradually finds that she has sold almost every thing which other women understand as happiness. But the root of this evil is perhaps

Infantine mortality.

out of reach of law—certainly out of reach of remedies which I am competent to advise. And I will only suggest, with reference to one part of the consequences, that factory-masters who employ adult female labour would do something to mitigate the sufferings and demoralization which result from it, if they would establish within their factories, under well-advised regulations, nursery-rooms, where working mothers might leave their infants in some proper and kindly charge, and might, as often as necessary, have access to them.

New Mortuary Returns.

Statistics for the exhibition of special morbific influences.

With reference to the matters discussed in the present and last preceding sections of my Report, I have not on this occasion adduced any precise statistical evidence. Statistics, generally justifying the assertions I have made, are given in my former reports, especially in the above-mentioned *Papers relating to the Sanitary State of the People of England.* But I am glad to say that very shortly those statistics will not be the most recent which can be adduced. Eighteen months ago, with their Lordships' authority, I brought under the consideration of the Registrar-General that very great help would be given to the progress of sanitary investigation if he, having regard to the then approaching new census of the population, and to the facilities which it would afford for the calculation of accurate death-rates, would cause to be prepared a *digest of all the mortuary returns relating to the intercensual period* 1851–1861, with such distinctions of *age* and *sex,* and such classification of *causes of death,* as would enable the student to estimate, at least with approximate precision, how far each district of England is affected by the several chief sorts of morbific influence. The Registrar-General, with his invariable willingness to assist inquiries of this description, resolved to make the suggested compilation. I have reason to believe that it is now in an advanced stage of preparation, and will at no distant period be completed. Ample means will then exist, and be universally accessible, for measuring the amount of mortal injury which different local influences inflict on different sections of our population.

In relation to this important object, and in relation to those local inquiries which it is their Lordships' function to make, the value of the promised compilation will be such as to mark a new era for sanitary studies in England.

From the Fifth Report to the Privy Council, 1862.

[The Fifth Report comprises a section relating to Public Vaccination which has already appeared in Vol. I., pp. 356–61; a section on the Distribution of Disease in England, relating to Industrial Diseases:—(1.) Occupations which have to do with Arsenical Green, (2.) Occupations which have to do with Phosphorus; a section on the Cotton Famine; a section on the Diseases of Live Stock in their relation to Meat and Milk Supply.—Ed.]

DISTRIBUTION OF DISEASE IN ENGLAND, AND THE CIRCUMSTANCES BY WHICH IT IS REGULATED—*cont.*

Industrial Diseases.

Industrial Diseases.

Of the inquiries made during 1862 into OCCUPATIONS WHICH ENDANGER HEALTH, two were completed. Reports relating to them,—viz., a report by Dr. Guy on the manufacture and applications of *arsenical green*, and a report by Dr. Bristowe on the manufacture and applications of *phosphorus* are appended [A].

1. *The Occupations which have to do with Arsenical Green.**

Working with Arsenic.

Work-people who have much to do with arsenical green are liable to suffer from its influence in two different ways;—

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* In connexion with the present inquiry, notice has necessarily been taken of the eventual uses which are made of arsenical green, and of the effect which some of these uses may have upon the public health. Although every one knows that the so-called "emerald green" is an admirable pigment, not every one knows and remembers that "emerald green" is a virulently-poisonous compound of arsenic. And hence it comes that the pigment is extensively employed in ways which are utterly improper in the case of so dangerous an article. Materials coloured by it are seen in many directions where the public, if duly informed, could scarcely consent to tolerate the danger;—not only on a comparatively small scale in the lining of boxes, the painting of children's toys, the wrapping and ornamentation of confectionery—if not even the confectionery itself, but also, and copiously, in the paper-hangings of rooms, and in the wreaths and tarlatanes of ball-dresses. Dr. Guy's report contains illustrations of the mischief which every now and then arises from one or other of these objectionable uses of the pigment.—J.S.

Working with Arsenic.

first, almost universally they suffer, and in many cases very grievously, from peculiar skin-affections which the irritating arsenical dust of the occupation engenders;—secondly, in many cases, the arsenic gets absorbed into the body, and produces with more or less severity the ordinary signs of chronic arsenical poisoning. These results do not fall with equal severity on all branches of the industry, nor on all industrial establishments, but, both in different branches of occupation and also in different establishments, proportion themselves to the intensity of the arsenical influence. It accordingly deserves particular notice that the occupations which have to do with arsenical green are pursued entirely without restriction by law. And the evidence now submitted with regard to these occupations corroborates, I think, very importantly the general conclusion which an accumulation of other evidence led me to suggest in my last annual report,—that all industrial establishments which directly or indirectly endanger health ought to be subject to official superintendence and regulation.

Sufferings from arsenical green arise much more during the applications, than during the manufacture and packing, of the pigment. Indeed the *manufacture*, if done in the open air, does not seem to produce extreme ill-consequences. The arsenical dust, like all dusts, irritates the mucous membrane of the nose and eyes: presently it begins to affect the skin (especially at the nostrils, at the bend of the arms, at the armpits, and at the scrotum) producing itching, blotches, rawness, and perhaps boils; and these inconveniences, it seems, commonly make the workman discontinue work before he has absorbed such a quantity of arsenic as would affect his internal organs and develop signs of true arsenical poisoning.

The *industrial applications* of the pigment are principally two:—first, in the colouring of various papers either of the sorts used for ornamental wrapping and lining, or of the sorts used for hanging in rooms;—secondly, in the colouring of artificial leaves, fruits and flowers. The pigment is also used, though less considerably, by chromolithographers and toy-makers. It is likewise used by house-painters. It is used as a colour for tarlatanes. And most culpably, though only to a small extent, it is used by the makers of cake-ornaments

Working with Arsenic.

and coloured confectionery. So far as concerns the health of persons employed, only the first two occupations require particular notice:—but, in them, there is very considerable suffering.

Thus, for instance, in visiting one of the larger establishments where artificial leaves are made—an establishment employing about 100 young women, Dr. Guy found that more or less suffering was almost universal among the work-people. The skin-affection, which hardly any of them escaped, and which sometimes would begin after even so little as one day's working, occurred in different degrees;—sometimes as mere erythema, sometimes as an eruption of clustered papules, vesicles, or pustules, sometimes as more or less destruction of skin by process of ulceration or sloughing. The fingers, which (often with accidental chops and scratches on them) are the immediate agents in the industry; the face; the neck, especially about the roots of the hair; the flexure of the arms; the axilla; the genitals;—these were the parts where the skin-disease had most shown itself,—parts, namely, to which the arsenical dust is most largely applied, and parts where it is likeliest to be retained, and parts where the cuticle is most thin and penetrable. The suffering from these skin-affections had been in many cases very considerable;—for instance, in several cases the mere pudendal affection had been such that the sufferers could not bear to sit down. But the skin-affection was only a minor part of the suffering. Of 25 of the sufferers whom Dr. Guy examined, nearly all showed signs, often highly developed, of chronic arsenical poisoning;—excessive thirst; nausea and loss of appetite; sickness and vomiting, often with pain in the stomach; palpitation and shortness of breath; debility, fever, headache, drowsiness, dimness of sight, and tremblings, nervous twitchings or convulsions:—" Of the whole group of 25 females (says Dr. Guy) " four only did not complain of weakness; and of the remaining 21, there were again only four who did not describe " the weakness as extreme. Febrile symptoms were present " in no less than 20 cases, in five of which they amounted to " feverishness, while in the remainder they were described as " fever. Headache, again, was an almost universal symptom.

Working with Arsenic.

" It was absent in two cases only, and was described as not
" severe in only three cases. Dimness of sight was com-
" plained of in two-thirds of the cases. In one the eyes were
" very sore, in another the sight was greatly impaired.
" Drowsiness was present as a marked symptom in every in-
" stance but one, and in two cases only was it spoken of as a
" trivial circumstance. Tremblings and convulsive twitch-
" ings were present in seven cases out of the 25, and in one
" other instance well-marked convulsions were present." It is wonderful that, out of such a group as this, deaths are not constantly occurring in a way to demand the coroner's investigation. But whatever may be the explanation of the fact, only one such investigation seems to have been made. The death which gave rise to it (and which occurred towards the end of the year 1861) was certified by the coroner's jury to be "Death by Arsenite of Copper." The victim—a girl of 19, whose case is told by Dr. Guy, had for 18 months without intermission, in spite of cruel sufferings, pursued her poisonous occupation. Her story during nearly all this time was but the common story of the workshop,—only the same sort of story as Dr. Guy elicited from many of those whom he examined. During the whole time she had "suffered from
" eruptions about the neck, scalp, and hands, accompanied by
" pains in the nose, with the common symptoms of a cold,
" great pain in the left side, frequent vomiting of food, and
" intense thirst. She was first seen by Mr. Paul [the medical
" man who attended her] on the 15th of November. She was
" in bed, breathing laboriously, and complaining chiefly of
" the pain in the side and frightful thirst. The countenance
" wore an expression of great anxiety, and the conjunctiva
" had a peculiar green tint. The pulse was about 120, and very
" small. The tongue was dry, brown down the centre, and
" green on each side. The vomited matter was quite green,
" but the discharges from the bowels had a natural colour.
" There was little diarrhœa. The skin was very hot. The
" abdominal parietes were drawn back, but the abdomen was
" not painful, except just over the stomach. There was
" a slight cough, but no expectoration. On the following
" day she still complained of pain and thirst, and her pulse

Working with Arsenic.

"was 130. At the evening visit the breathing had become "much more laborious, and the pupils were dilated. On the "17th the pulse was of the same character, but increased in "frequency. The vomiting continued till the evening, when "she still complained of the pain, which was worse. On the "18th she was found in the same state, but on the 19th she "was seen to be sinking fast. She had twitchings of the "left side of the mouth, and was scarcely able to speak, but "she said that everything she looked at was green. The "pulse had risen to 140. During the night of November 20 "she became insensible, and died at 11 a.m."

The tortures which that poor girl must have endured will not have been in vain, if, as may be hoped, the public knowledge of them leads to the amendment of a system under which others are still day by day enduring in different proportions the progress of a similar fate.

The restrictions under which this injurious, and perhaps not indispensable, branch of industry ought alone to be carried on are, in my opinion, as follows:—first, as a cardinal rule (the enforcement of which would make it an interest of each establishment to enforce various improvements of detail) the employment of any person while presenting even in the slightest degree any sign of general arsenical poisoning should be absolutely prohibited;*—secondly, by scrupulous cleanliness of the workplace and workers, by ventilation of the workplace, and where necessary by special apparatus, the best known means should be used to prevent the diffusion of arsenical dust in the common atmosphere of the workplace, and to reduce the worker's liability to receive the dust upon his hands.†

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* The observations which in my last annual report (p. 48 foot note) I made on the injurious effects of extreme subdivision of labour are applicable to the present subject. Working with an arsenical pigment might not cause any appreciable injury to health, if it formed only a small part of the worker's total occupation. A manufacturer, properly organizing his business, ought of course to secure this result; and the rule which I have suggested in the text would perhaps be the readiest mode of bespeaking his exertions to secure it.—J.S.

† The dangers to which the general public is exposed by the various ulterior uses of emerald green (see former foot note at p. 60) cannot, for the most part, be adequately guarded against except by better public knowledge on the subject. It would be desirable, however, that the uses of emerald green by confectioners,

2. *The Occupations which have to do with Phosphorus.*

Working with Phosphorus.

The utilisation of phosphorus in various popular contrivances for producing instantaneous light has, for the last 30 years, been a special industry. And with the growth of this industry, a new disease has come into existence. About 18 years ago observations began to be published to the effect that, of the workpeople who in the new industry were exposed to the vapours of phosphorus, some, but apparently not a large proportion, suffered in consequence of the exposure a peculiar disease of the jaw-bones; namely,—that, after a variable premonitory period of such moderate local irritation as might be supposed to be mere common toothache or gumboil, evidences of destructive bone-disease—affecting commonly at first only a small portion of bone, but perhaps eventually invading all or nearly all of the lower or of the upper jaw, would become manifest,—that in average cases of this very painful and very loathsome disease, recovery was not got except after sufferings which could scarcely be of less than many months', and often were of some years', duration,—that in severe cases the patient was likely to sink under the pain and exhaustive discharges of the disease, and that at best he would be left deformed and mutilated. Almost as soon as the disease was recognised, investigations were made into the details of its pathology. And these investigations seemed to establish as certain, that the disease is in its origin purely local,—that it depends on an influence which the fumes of phosphoric acid, when they get dissolved in the saliva, are able to exert directly and specially within the mouth.*

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either for confectionery itself, or for any wrapping or ornament of confectionery, should be punishable by summary proceeding. And it would also be desirable that the sale of emerald green and of objects coloured with it should be subject either (*mutatis mutandis*) to the same rules as govern the sale of white arsenic, or at least to such rules as would ensure the purchaser's being fully informed that the commodity which he purchases is poisonous.—J.S.

* Von Bibra, the most important among the original writers on the disease, believed, both from inquiries which he made of work-people, and from experiments which he performed on rabbits, that the phosphorus fumes could not act hurtfully on the jaw if the teeth and gums were in a normal state; and from his teaching it has been commonly believed that a carious state of teeth (as allowing

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From the inquiry which has now been made under their Lordships' direction into the circumstances of the phosphorus-industry in England, it appears (as had been anticipated) that the jaw-disease which I have described is not of frequent occurrence. Dr. Bristowe, after visiting all the known match-making establishments in England—57 establishments, employing about 2,500 hands, has not been authentically informed of more than 59 cases (past or present) of jaw-disease. And though doubtless in some instances information has been withheld from him by manufacturers who feel that their experience has not been creditable to them,—so that the total production of jaw-disease during the last 30 years has been greater, perhaps considerably greater, than these numbers express,—yet very probably there would be no under-statement of the truth in applying these numbers to the *present time*, and in assuming that now (with the improved arrangements which a less favourable early experience has induced all respectable manufacturers to adopt) not more than two or three cases of the jaw-disease are annually produced in England. Almost certainly, however, these few cases occur under circumstances which the manufacturer ought not to let exist, and which—if dangerous occupations were subject to official superintendence, would of course be forbidden to continue. For, as Dr. Bristowe observes, "while it is the easiest thing in the world for a factory "to be made a hot-bed of disease, it is little less easy, "by adopting precautions of the simplest and most obvious "description, to render the occurrence of jaw-disease therein "a rare and quite exceptional occurrence."

Those precautions of the "simplest and most obvious "description," to which Dr. Bristowe refers as essential for the phosphorus-worker's safety, and respecting which he gives in his report all needful particulars, are, in principle, two:—first, that the organization of the establishment shall

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the acrid influence of the phosphorus-fumes to soak more easily to the deeper textures of the jaw) is the great predisposing circumstance against which precautions ought to be taken. From statements made in Dr. Bristowe's report it seems that Von Bibra's conclusion ought not, without further inquiry, to be taken as absolutely established, and Dr. Bristowe has therefore been instructed to seek for proofs which may be conclusive on the subject.—J.S.

be such as not at any time to expose to phosphorus-fumes more workers than must necessarily be exposed to them,* and such as to restrict this necessary exposure within the narrowest possible limits of time and intensity; secondly, that the establishment shall have suitable ventilation—including of course special ventilating-arrangements for those processes of the manufacture which cause the greatest evolution of fumes. That precautions to the above effect are entirely effective for their purpose, is shown by many passages in Dr. Bristowe's report,—passages which contrast the experience of well-conducted establishments with the experience of ill-conducted establishments, and justify me in referring exclusively to ill-conducted establishments the production of all jaw-disease which there has been. One such passage, which contrasts the experiences of a single establishment at two different times of its working, is so suggestive that I quote it here in Dr. Bristowe's words:—

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" By far the most remarkable and instructive experience " of the disease, however, is that afforded by a congreve-" manufactory in Manchester, which is one of the largest in " England, and in which 250 persons, exclusive of box-makers " and splint-cutters, are constantly employed in the various " processes of match-making. This factory has been in ex-" istence for about 25 years, and during the first 20 years of " its operations, no less than 24 cases of jaw-disease occurred. " The jaw-disease too, in this case, was not limited, as in most " other factories, to the dippers and mixers, and consequently " to adults; but the boxers, the cross-cutters, and the pickers " out, formed a large proportion of those affected; and children, " from 12 to 15 years of age, suffered as well as their elders. " The explanation, however, is easy, and was pointed out " to me with great candour by one of the proprietors. The " fact is, that all those various conditions, which tend to " the production of the disease, were here concentrated " and combined; and all the operatives became nearly " equally exposed to the fumes of phosphorus. A very large

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* Whether these must always be the same persons is a question which I think deserves consideration. *See* preceding foot notes, pp. 48 and 64.—J.S.

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" number of workpeople was employed. They were confined " in low, ill-ventilated, over-crowded rooms. The dipping, " the drying, the boxing, &c. were all carried on in the same " apartment. Bundle-dips formed a large proportion of the " matches which were manufactured; and the composition " employed contained one-third by weight of phosphorus. " Further, at one period (and about that time the disease " was most prevalent) the operatives worked far into " the night, as well as by day. About five years ago, " the proprietors, who had been much concerned by the " frequent occurrence of the disease, set to work seriously to " remedy the defects on which they believed it to depend. " They constructed large, airy, well-ventilated rooms, they " gave up the manufacture of bundle dips, and they diminished " by one-half the strength of their composition. The result " has been, that not a single case of the disease has originated " in this factory, during the five years that have elapsed, " since the above improvements were effected."

The dangers to which I have adverted as belonging to the phosphorus-industry belong exclusively to working with *common* phosphorus. Working with *amorphous* phosphorus is unattended with danger to health. Since, however, it appears that, with reasonable precautions, the use of common phosphorus for match-making needs not be an unwholesome occupation, I cannot say that, in my opinion, the substitution of amorphous for common phosphorus in the manufacture is, for sanitary purposes, an object to be unconditionally insisted on. Yet having regard to the fact, that amorphous phosphorus not only is manufactured without danger to the worker, but that its use in lucifer-boxes (according to the patented plan of Messrs. Bryant and May) also involves infinitely less danger of fire than belongs to common lucifer boxes,—I think that the substitution is altogether one to be desired. And of course, with reference to any restriction which the Legislature might think of imposing on the utilisation of common phosphorus, it would deserve to be remembered that manufacturers would have at their option the alternative of using without restriction the innocuous amorphous material. As regards the admissibility of this material, I beg to refer to the statements thereupon which Dr. Bristowe quotes from three principal firms of matchmakers.

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Before closing the present section of my report, I must specially mention that, in both the industries reported on, young people, from childhood upward, are employed in uncertain proportion. If the occupations are to be so regulated as no longer to include special causes of unhealthiness, the question whether young persons shall work in them will only be part of the more general question (on which I need not now dwell) whether the employment of young persons, as such, should be the subject of particular restrictions. But if the occupations—and especially the first mentioned of them, are to continue unregulated, it will certainly deserve particular consideration that, among the persons exposed to injury, are persons whom the law of this country supposes incapable of properly defending their own interests.

The employment of young persons in unhealthy occupations.

THE COTTON FAMINE.

In the month of October last there was room for very great anxiety as to the sanitary prospects of the cotton-districts of England.

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The staple industry of those densely-peopled districts—the industry which previously gave livelihood, direct or indirect, to two millions of population, had for some months been declining, and was now probably at not more than a sixth part of its usual activity. Wide-spread bitter poverty was of course the result.

And this poverty was in strong contrast with former circumstances. The affected class was not a common low-typed proletariat, familiar with parish doles, and preferring pauperism to labour. On the contrary, it was a people long accustomed to prosper on the fruits of its own labour; a people having among it a good deal of mental culture and some great moral qualities; a people legitimately proud of its old self-supporting

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power and independence. Borne down of late by the increasing stress of a poverty which was quickly tending to become absolute privation, the sufferers had not clamored as to their growing need for help. Even to the last they had rather shrunk from disclosing it. Swarms of them had long been hungering in silence. As wages had begun to fail, first, in many cases, there were previous well-earned savings to be exhausted; then, in nearly all cases, there was household furniture and bedding, or at least clothing, which might be pawned or sold. Gradually during the summer these resources had been drawn upon; but doubtless very reluctantly, not at the first partial failure of wages, not till hunger became urgent, not a bit more than hunger must have its way.

And now, in October, a crisis in this long contest was at hand. Besides the pauperism which was known, there was an unascertainable, but enormous, amount of impending destitution. The ill-nourished were in myriads. Machinery, local or national, for giving relief to the distressed populations, such machinery as afterwards became most efficient, was hitherto but imperfectly organized. There was imminent danger that death on a large scale might result directly or indirectly from starvation.

Foremost there was the unwonted possibility that England might have to endure, almost without power of arresting if begun, the terrible spectacle of a famine fever. For the circumstances under which true TYPHUS—the "gaol-fever," the "camp fever," the "ship-fever," of our ancestors, can do its worst as a national epidemic, are provided for it by extreme poverty and destitution. The disease is never otherwise than contagious, and its contagion spreads like wild-fire among any half-famished population. Sixteen years ago, Ireland had had this most dreadful of sanitary experiences. And now, in October, there were rumours and, as afterwards appeared, well-founded rumours, that typhus had begun in our cotton-districts. There was the knowledge, too, that wherever typhus might show itself in those districts, hunger would not be the only baneful influence in favour of its spread. Eminently contagious as it is by means of exhalations from the sick, and only partly divestable of that property by even the

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best ventilation of the best hospitals in Europe, it must of absolute necessity spread wherever persons who have not previously suffered its attack encounter its intense contagium in over-crowded, ill-ventilated dwellings. And this danger had to be apprehended in the cotton-districts. For means of rent-paying had ceased. Partly in consequence of eviction from former lodgings, partly in voluntary search for the cheapest obtainable shelter, the population had been gradually getting more and more restricted in dwelling-space. As colder weather began, as the want of fire began to be felt, as the absent clothing and bedding began to be missed, so, more and more, for warmth's sake, the dwelling-spaces were sure to be without ventilation, and the inmates to be huddled together. Within the atmosphere of any such dwelling-places, the spark of typhus-contagion, if it should enter, would find every opportunity to spread.

Under these circumstances, my Lords had to watch carefully all fluctuations of health in the distressed districts, and to satisfy themselves that due local precautions were being taken to prevent the destitution which breeds disease. With this view their Lordships determined to have for the rest of the year a medical inspector constantly in the suffering districts, from whom every day they might receive information, or through whom give advice, concerning these very important matters; and the gentleman, whose services I under their Lordships' directions engaged for the purpose, was Dr. Buchanan, one of the physicians to the London Fever Hospital.

As I append [A] the summary report which Dr. Buchanan made when his inspection was drawing to an end, I have only to describe in general terms the duty which he performed. His attention was of course primarily directed to those towns where true typhus prevailed or was rumoured to prevail. His first and longest visit was therefore paid to Preston, and afterwards inquiry was made into the alleged existence of fever in Ashton, Blackburn, Chorley, Darwen, Manchester and Salford, Stockport and Wigan. More recently Accrington, Bacup and Bolton were visited with the same object. At Ashton, Stockport and Wigan, no remarkable excess of

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fever was found; at Darwen, Bacup, and Bolton fever was found with unusual prevalence, but the fever was typhoid, not typhus; at Blackburn, Chorley, and Salford there appeared to have been scattered cases of true typhus; at Accrington* and Manchester such cases were in larger numbers; and in Preston the epidemic was considerable.†

In all the towns enumerated, as also in Bury and Oldham, inquiry was made into the general sanitary circumstances of the poor, and especially of the unemployed cotton operatives. So far as was needful for their Lordships' purpose, Dr. Buchanan communicated with the different local authorities and their officers, and conveyed their Lordships' suggestions as to the means that appeared most desirable for preventing the outbreak or checking the progress of disease. Especially he drew attention to cases where the allowances made to the unemployed population were not enough to maintain health, to cases where clothing and bedding were deficient, and to cases where overcrowding and uncleanliness were tending to multiply infectious disease. In these and like cases he discussed in detail with local authorities and their officers the remedial means which in the particular town were most applicable. Also, in order to guard against contagious fever spreading in those towns where it had appeared, he conveyed their Lordships' strongest recommendations that the sick should be removed, from their commonly overcrowded and

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* Accrington was not visited till January. It then appeared that 40 cases of true typhus had occurred since the middle of October. Among these there had been 9 deaths.—J.S.

† In all those towns where most typhus fever was seen, the disease attained its maximum of prevalence before December, and in that month there appeared a decline in its epidemic force. At Accrington and Manchester at the beginning of January the fever had so far ceased that for a fortnight scarcely a single new case had come under treatment in either town. In Manchester the monthly variations in the amount of typhus are best measured by the experience of the parochial fever hospital, where alone typhus patients are received in any number. Since Midsummer the admissions for this disease had been as follows:—In July, 7; in August, 8; in September, 12; in October, 20; in November, 25; in December, 17; and in January, 16, all in the latter part of the month. Besides these there were cases treated at the infirmary and at their own houses. At Preston the attacks of typhus (as reported by the public medical practitioners to the Local Board of Health) were as follows from month to month. In July, the new cases numbered 2; in August, 8; in September, 33; in October, 95; in November, 95; in December, only 42; and in January, 41.—J.S.

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unwholesome homes, to hospitals. And where the hospital-accommodation of a town threatened to become inadequate, means for meeting any increased demand which might arise were suggested.*

While getting intelligence with regard to the progress of the cotton famine, and of the measure taken for its relief, their Lordships found it expedient also to provide themselves with more exact scientific information than was at the moment available with regard to the minute economics of diet. What was the least outlay of money which would procure food enough for healthy life?—and what plan of outlay would purchase the largest amount of true nourishment?—these questions were constantly under discussion. Questioners were naturally solicitous for an almost fractional accuracy of answer, and special scientific investigation was needed to supply the material for answering. Accordingly, under their Lordships' orders, I requested Dr. Edward Smith to make all requisite inquiry for this purpose. And the result is a report which discusses very minutely the whole subject of dietaries for the poor [A].

It was a most satisfactory issue to the anxieties of 1862 that typhus did not become extensively prevalent in the cotton-districts, and that, so far as the facts are yet known, there was no other great local derangement of the public health.

Because the Registrar-General's detailed information as to district-mortality is not available till about 18 months after the expiration of the year to which it relates, I cannot speak with confidence as to the exact influence which the cotton-famine has exerted on the death-rates of the affected populations. But, meanwhile, I would venture to suggest that caution is necessary in interpreting one broad fact which the Registrar-General has made public. It is certain that in some of the cotton-districts, during the winter months, the total mortality

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* Preston was the only town in which, at the time of Dr. Buchanan's visit, further provision for fever patients was urgently required, and here the immediate construction of temporary fever wards was advised. Accordingly a wooden building adapted for 60 patients, on a plan agreed on by the Borough Surveyor and Dr. Buchanan, was erected in November.—J.S.

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was less than usual; but it does not therefore follow (as some commentators on the fact have apparently believed) that the health of the distressed operatives was substantially better than usual,—that the privations which their enforced idleness entailed on them were less hurtful than their factory-occupation of common times. No doubt, indeed, but that factory-occupation produces, on a very large scale, chronic ill-effects on health; but, till further evidence be given, it must not, I think, be assumed that an interruption of factory employment can rapidly make such a diminution in the death-rate of the operatives as shall outweigh the evidence of injury from considerable degrees of privation. Assuredly, such a conclusion cannot be based on any facts which have yet been published with regard to the matter in question. A smaller than ordinary number of deaths in particular cotton-districts during the past winter may have been only one of those common predictable fluctuations of mortality which go to furnish average local death-rates, and may, indeed, have been a higher mortality than the districts without the cotton-famine would have had. But where this was not the case, where the cotton-famine truly lessened the local mortality, the saving may not have been of adult life. It may have been exclusively of infants. For the closure of the factories withdrew perhaps the deadliest influence with which the infantine population of the cotton-districts has to contend, —the influence which (as was shown in my last report) is exerted against infant life by the industrial occupation and absence of mothers. And, having regard to the great importance of this change, I can well conceive that in some places the total number of deaths may have been notably smaller than usual, even though the adult mortality have been considerably heightened by the cotton-famine.

These considerations are not advanced as of mere speculative interest. In the uncertainty which at present must be felt as to the industrial prospects of the cotton-workers, and with reference to the possibility that another winter may have to be faced under circumstances like those of the last, it is, in my opinion, of great practical importance that the sanitary dangers of privation should not be at all underrated.

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Obviously, as regards the past, it is matter of fact that evils which might well have been anticipated did not fall, or at least did not heavily fall, upon the distressed populations. And for this happy result thankfulness is due, partly to the noble and successful exertions which were made, both locally and nationally, to avert extreme destitution from the endangered masses of population, and partly to the almost singular mildness of the winter.

But so far as that winter's experience of the cotton-famine is to be deemed prospectively applicable, it will be essential to remember that of the two influences by which the famine was alleviated, only one was of human option;—that the other might, notwithstanding all hopes and wishes, have been absent;—that, if the temperature of last November had continued through December and January—still more, if the temperature of these two months had (as usual) been much below the temperature of the November, the sufferings of the population must have been far severer than they were, and typhus could not but have spread much more extensively than it did.

DISEASES OF LIVE-STOCK IN THEIR RELATION TO THE PUBLIC SUPPLIES OF MEAT AND MILK.

Cattle diseases in relation to supply of Meat and Milk.

Allegations have during the last few years been abundantly made, and have with the progress of time become more and more definite, that the flesh of animals slaughtered while in a state of disease, and likewise the milk of diseased animals, are extensively sold for human consumption in the United Kingdom. And the substance of these allegations has been submitted to the Lords of the Council. In 1862 their Lordships ordered an inquiry to be made in this matter, and under their directions I requested Mr. John Gamgee, Principal and Professor in the Edinburgh New Veterinary College, to report on it. For their Lordships' purpose it was likewise desirable that inquiry should be made as to the circumstances under which the more important diseases of stock prevail in the

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United Kingdom, and particularly into the influence of importation and of home-trade in spreading the infection of such diseases. So Mr. Gamgee was instructed to report also on this matter. And he was further instructed to quote in his report any statements credibly made to him as to injurious effects resulting to man from the consumption of the flesh or milk of diseased animals. In order to collect all requisite information for his report, Mr. Gamgee was authorized to visit any principal markets and slaughter places in the United Kingdom, as well as any districts where he might believe that disease was particularly rife; and he was further authorized to visit certain parts of the Continent with which our stock-trade is most active, and whence it seemed most possible we might be receiving infectious importations of stock.

Under the above instructions Mr. Gamgee has recently made a report [A]. His evidence is, in substance, as follows;—that disease prevails very extensively in the United Kingdom among horned cattle, sheep and swine; that the diseased state of an animal not only does not commonly lead the owner to withhold it from being slaughtered for consumption as human food, but on the contrary in large classes of cases (especially where the disease is of an acute kind) leads him to take immediate measures with a view to this application of the diseased animal; and that consequently a very large proportion (Mr. Gamgee believes as much as a fifth part) of the common meat of the country—beef, veal, mutton, lamb, and pork, comes from animals which are considerably diseased.

The diseases which figure behind the scenes of our dead meat market are of course various. And although for the purposes of this report it is not necessary to enter upon much detail concerning them, yet, in order to discuss their probable effect on the quality of meat, the more important kinds of disease must be separately spoken of. And they are three;—viz.: first, *contagious fevers*;—secondly, the so-called *anthracic and anthracoid diseases*;—thirdly, *parasitic diseases*.

Of the *contagious fevers* of stock, two are now widely prevalent in the United Kingdom,—namely, the *pleuro-pneu-*

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monia or lung-fever which is peculiar to horned cattle, and the *aphthous fever, foot-and-mouth disease,* which affects indifferently and in common horned cattle, sheep, and swine. A third disease of the same class—the *small-pox* of sheep, perhaps of all murrains the most dreaded in this country, is not known to be now prevailing among our flocks; but, a few months ago, an outbreak of it in Wiltshire excited the greatest alarm; and it is a disease which may at any moment be spreading here. A fourth most important contagious fever of stock—the very fatal *typhoid fever or steppe-murrain* of Russian horned cattle, has happily been kept away from us for more than a century, partly by the exertions which are made in Russia to limit the disease to those provinces where it is endemic, partly by the strict precautions which are taken at the eastern frontiers of Prussia and Austria to prevent contagious importations;—and while this system continues in operation, the steppe-murrain is of little practical interest to us.

Of the so-called *anthracic and anthracoid* diseases of stock —diseases which German pathologists have generalised under the name of *milzbrand,* many prevail to a great extent in the United Kingdom, though for the most part as endemic diseases, localised in particular sections of the country. It is said to be an essential character of these diseases, that the blood of the diseased animal undergoes peculiar—in some respects putrefactive—changes; but commonly the disease involves an occurrence of local infiltrations and effusions of putrescent blood-ingredients or blood; and in many cases there also occur, either primarily or secondarily, gangrenous changes (erysipelatous or carbuncular) in some superficial solid texture of the body. Diseases of this class are further characterised by the fact that during their course the diseased body develops in itself a specific morbid poison which by inoculation can be made to spread the disease to other animals, including man. The diseases which Professor Gamgee counts under the present head are as follows:—the *splenic apoplexy* of horned cattle and sheep, the *braxy* of sheep, the *black quarter* of horned cattle and sheep, the *glossanthrax or tongue carbuncle* of (almost exclusively) horned cattle, the *forms of*

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anthrax which affect the mouth, pharynx, and neck in swine; the *apoplexy* of swine, and their so-called *blue-sickness or hog-cholera*, the *parturition-fever* of cows, the corresponding *heaving-pains* of ewes, the *navel-ill* of lambs, and the *red-water* of sheep.

Thirdly, there are the *parasitic* diseases of stock,—diseases which consist in the colonisation of the living animal's body by lower animal forms, larval or mature, subsisting at its expense. Such are the following diseases;—the so-called "measles," of the pig, in which disease the *cysticercus cellulosæ* (larva of the *solium* tapeworm) is found more or less abundantly diffused through the muscular system, and perhaps in other parts, of the animal;—the analogous disease of horned cattle, due to the larva of the *t. mediocanellata*;—the various, chiefly visceral, diseases of stock which depend on larvæ of the *tœnia marginata* and *t. echinococcus*;—the brain-disease, "gid" or "sturdy," which is due to a larva, mostly of the *t. cœnurus*;—the rot of sheep, due to swarms of adult and oviparous fluke-worms (*distoma*) in the liver;—the lung-disease which, especially in calves and lambs, is produced by different kinds of *strongylus*;—the easily-overlooked, but highly important disease of swine, which consists in an infestation of their muscular system by the minute immature forms of the *trichina*.

It is for obvious reasons impossible, in the present state of knowledge, to state in detail what income of morbid product flows from each of the above-mentioned sources into the markets which supply us with food. But from Mr. Gamgee's report, together with such other information as he has given me, I gather that, so far as he can learn, the truth is about as follows:—that horned cattle affected with pleuro-pneumonia are, much oftener than not, slaughtered on account of the disease, and when slaughtered, are commonly (except their lungs) eaten; and this, even though the lung-disease have made such progress as notably to taint the carcase;—that animals affected with foot-and-mouth disease are not often slaughtered on account of it, but if slaughtered, are uniformly eaten;—that animals affected with anthracic and anthracoid diseases, especially swine and horned cattle

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thus affected, are (except their gangrenous parts) very extensively eaten; that the presence of parasites in the flesh of an animal never influences the owner against selling it for food;—that carcases, too obviously ill-conditioned for exposure in the butcher's shop, are abundantly sent to the sausage-makers, or sometimes pickled and dried;—that specially diseased organs will often, perhaps commonly, be thrown aside; but that some sausage-makers will utilize even the most diseased organs which can be furnished them;—that the principal alternative, on a large scale, to the above-described human consumption of diseased carcases is, that, in connexion with some slaughtering establishments, swine (destined themselves presently to become human food) are habitually fed on the offal and scavenage of the shambles, and devour—often raw and with other abominable filth, such diseased organs as are below the sausage-maker's standard of usefulness.*

This, in general terms, is Mr. Gamgee's report on the subject. Disgusting as are the reflections which it suggests, there is not in it, I think, anything intrinsically improbable. For obviously wherever there is dangerous disease among stock, the owner's commercial instinct will be to make whatever salvage he can; and while he must well know that selling dead stock for meat pays better than selling it for manure, the public has no sufficient safeguard against his yielding unreservedly to that motive. And if, while his stock is suffering with even the most loathsome of diseases, he thinks fit to have each animal as it sickens, or even as it gets moribund, slaughtered and dressed for the market, assuredly there will often not be any effectual obstacle to his carrying that wish into effect.

One doubt, however, may well be raised on the subject. A first popular impression would be, that, if things are as described, pestilences must be bearing witness to the fact. Is it possible—may be asked—that cattle, having all the foulness of fever in their blood, or having local sores and

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* Mr. Gamgee's description of the state to which the swine are brought by this diet raises the question whether for the purposes of this report, they might not themselves properly be classed with diseased animals.—J.S.

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infiltrations that yield one of the deadliest of inoculable morbid poisons, or having their flesh thronged with larval parasites,—is it possible that such cattle can be converted into human food, and yet not only the immediate scandal of a general poisoning be escaped, but even something not unlike general impunity be the result? Though the affirmative answer to this question may at first sight seem strange, nevertheless it is, with some qualifications, the true one. And doubtless the impunity, such as it is,—but it perhaps is far less general than it appears,—results from the operation of well-known chemical and physiological laws. Our animal food before we take it has for the most part been exposed to so high a temperature that any parasites which had their home in it are killed, and that whatever albuminous morbid contagium it contained has been coagulated and made inert. Probably too, against small quantities of animal poisons—and against such as communicate small-pox and glanders, just as against the venom of the cobra and rattlesnake, the stomach has resources of its own;—for any such organic product entering the stomach is at once (as regards that mobile chemical constitution on which its efficiency depends) exposed to the strong disinfectant chemistry of digestion, and thus, within narrow limits of quantity, is likely to be rendered inert before it can soak into living texture. Both these influences may count for something, and the first-mentioned of them for almost everything, in explaining the fact (so far as it is a fact) that many sorts of diseased meat are eaten with impunity. On the other hand it must be remembered, that, in this theoretical explanation, the two protective influences do not cover the whole field of danger;—for, in the first place, not all meat which is eaten has been exposed throughout (nor in every instance even at all exposed) to a temperature sufficient to kill parasites, and coagulate albumen; in the second place, even complete coagulation of albumen may, for aught which we know to the contrary, leave some morbid poisons in operation; in the third place it may very well be, that, even where cooking can divest a meat of some original specific infectiveness, the meat may still not be susceptible of quite the same digestional changes

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as healthy meat, when eaten, undergoes. And thus the theoretical apprehension would be, that, with our alleged large consumption of variously-diseased meat, the impunity of consumers, though it were the rule, might be subject to considerable exceptions.

Accurate empirical knowledge in this matter is hitherto only beginning to be gathered, and will not yet warrant any general dogmatic statements as to the effects of diseased meat on human consumers. But for another purpose, as I shall proceed to illustrate, even that scanty knowledge is not insufficient. Supporting, so far as it goes, the theoretical arguments which I have just used as to the possible dangers of the practice in question, it will at least suffice to justify much public caution on the subject. And in this point of view it may be convenient to notice, under separate heads the evidence which now exists as to the injuriousness of each chief kind of diseased meat.

(*a.*) First, as regards meat which is *infested with parasites*, —we know with absolute certainty that this may become a source of human disease. Every tapeworm found existing in human bowels was once a cysticercus, or other hydatid, nested either in the living muscle or in some other living texture of an animal which is used for food. Tapeworm unfortunately is not a very rare human affection; though how it comes to pass that we, not very rarely, get to swallow alive those cystic brute-parasites which are larvæ of the intestinal tapeworm, is somewhat difficult to explain. A mouthful of fresh "measly" pork, eaten raw, would of course explain such an occurrence. But the cysticercus cannot outlive being cooked; and as the form of cured ham, bacon and sausage is the only form in which uncooked pork is even scantily an article of diet among us, it seems probable that cysticerci may outlive some or all of the processes by which meat is commonly cured, and may thus get swallowed alive by persons who eat uncooked sausage, ham, or bacon.

This however is not our only concern with the tænial order of brute-parasites. Dogs and other animals which get opportunities of eating the raw offal of slaughter-houses are constantly swallowing live larvæ which afterwards become

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mature tapeworms within them. The mature tapeworm, holding fast by its head to the mucous membrane of its host's intestine, sheds from its other end the successive egg-bearing joints which it developes there; and wherever the tapeworm lodging animal passes, these fertile fragments get dropped in all directions with excrement, and lead of course to a wide and dangerous dispersion of eggs. Often the eggs must find their way into sources of drinking-water, or on to various low-growing vegetables or fruits which are apt to be consumed in an uncooked state by man; and if, with any such vehicle, man swallows a live tapeworm-egg, he immediately has the egg hatched within him, and now in his turn suffers from the larval form of the parasite. Fresh from its egg, the young sexless animal, which he has swallowed, burrows through the wall of his stomach or intestine, and, having thence migrated to some more or less distant part of his body, grows there, destructively, to its full larval development as a cystic entozoon;—perhaps to show itself one of the sporadic locally sterile cysticerci which are commonest in man's muscle, cellular membrane, eye and brain; or perhaps (and this oftenest in man's liver) to prove itself the pill-box hydatid or echinococcus, and to illustrate one of the most striking stories of so-called "alternate generation," by breeding almost unlimitedly from its own larval substance, as by buds, new cysts which repeat the form and inherit the fertility of their strange sexless parent.*

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* It is in Iceland that the saddest experience exists as to the above-described "alternate generations" of the tapeworm. There the diseases which are due to the various stages of various kinds of tapeworm prevail to an enormous extent among both men and cattle. Dr. Arthur Leared (who has recently investigated this subject in Iceland, and has kindly permitted me to read the English manuscript of an essay which he has published in Icelandic on the result of his inquiry) says, on the authority of Dr. Hjaltelin, of Reykjavik, that a fifth part of the human mortality in Iceland is caused by hydatid disease. And how great is the influence which the dog exerts as an intermediary in propagating such disease cannot be better illustrated than by the fact of Dr. Leared's having suggested, as one of his two measures for preventing the human hydatid disease, that all the dogs of the island should be medically treated for tapeworm. "The evidence "against the dog in this matter" (says Dr. Leared) "rests upon numerous "experiments conducted under circumstances leaving no doubt that tapeworms "were produced by feeding them on fresh [hydatid] bladders. The conditions "necessary for the propagation of the worm are nowhere so complete as in Ice-

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Tapeworms are not the only injurious parasites which man may receive from the animals which he eats. Quite recently it has been discovered that a microscopical thread-worm, the so-called *trichina spiralis*, brings, perhaps not very rarely, the muscular flesh of swine into a state in which a small quantity of it, eaten raw, will suffice to destroy life;—viz.,—that the sexless larval trichinæ, which may be counted by hundreds in any small mass of the diseased muscle, will acquire their sexual development directly they reach alive the stomach of the muscle-eating animal; that, unlike the tapeworm (which commonly sends forth its eggs to hatch somewhere outside the body wherein it dwells) each trichina will breed swarms of young within the intestinal canal of its host; and that these innumerable young, migrating from the animal's intestinal canal to all parts of its muscular system,

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" land. The farmers kill their own meat, and the offal, frequently containing " living [hydatid] bladders, is the food of the dogs. Abundance of mature " worms are thus produced. Again, the whole country is one vast pasture, " and dogs are universally employed in managing the sheep. These dogs shed " everywhere segments of tapeworms, the eggs from which are diffused by rain " and melted snow. . . . . . . Each segment is filled with innumerable " eggs, invisible to the unassisted eye, which are not set free in the intestine of " the dog, but in the outer world, by the decay of the case containing them. It " is impossible to say to what extent these eggs preserve their vitality, but so " resistent is the outer shell, that I have found them, by examination with the " microscope, quite intact after having been steeped for twelve hours in strong " sulphuric acid. It seems that desiccation is most fatal to their vitality, and " there can be no doubt it is for this reason that sheep are much less liable to " staggers in dry seasons and on high grounds, than when the season is wet or " their feeding grounds are low and damp. . . . . These eggs finding their " way into drinking water, or adhering to articles eaten raw, as bilberries or the " stalk of the *Angelica*, are swallowed by men. The hands are even liable to be " infected from contact with the grass, so that the eggs may easily be swallowed " with ordinary food, or from the casual application of the hand to the mouth." The plan on which Dr. Leared recommends that the dogs of Iceland should be treated is that they should all at one and the same time be dosed with *Kamala*, an Indian vegetable drug, which Dr. Leared describes to be a very efficient (as well as cheap and tasteless) remedy against tapeworm.

The scope of my report does not allow me to enter upon the history of the singularly interesting inquiries through which, during the last twenty years, the genesiology of parasitic worms has been gradually becoming clear to us. I would only venture to express my deep sense of the services which have been rendered to practical medicine, not less than to exact science, by the researches of Steenstrup, Van Beneden, Küchenmeister, Van Siebold, Stein, Leuckart, and others; and especially by those conclusive experimental investigations which are due to the example and suggestions of Küchenmeister.—J.S.

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will create an amount of irritation which often is sufficient to kill. This result has been witnessed, not only among various lower animals whereon the experiment has been abundantly tried, but also quite indisputably in man.* And the danger to man is even greater than I have yet said. For pork, in order to be capable of carrying live trichina-larvæ into the stomach, needs not to be absolutely raw. Professor Leuckart, a distinguished experimenter on this subject, has found trichina-meat retaining much of its dangerous qualities even when it had to some considerable extent undergone both pickling and smoking.

(*b.*) As regards possible ill-effects from consuming, in a well-cooked state, the flesh of animals with *anthracic or anthracoid disease*, evidence is still imperfect;—partly, no doubt, because extreme ill-effects do not generally result from such eating, but partly also because, till public attention is drawn to the subject, it must be difficult to trace to their true cause any ill-effects which are thus occasioned. Mr. Gamgee tells me that he has experimented on this subject,—and that dogs and ferrets, to which he has given (cooked) various parts of animals slaughtered during splenic apoplexy or parturition-

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* See especially in Virchow's Archiv, vol. 18, papers by the Editor and by Prof. Zenker of Dresden. Prof. Zenker incidentally mentions, that among 136 post-mortem examinations which he made during eight months of the year 1855, he found four subjects evidently affected with trichina. He gives in detail the case of a farm girl who died under his observation in 1860, killed by trichinæ. She had a month before been taking part with the other farm-servants in a particular pig-sticking and in the consequent processes, and had probably (according to what is said to be a not very unusual practice) taken an occasional pinch of the sausage-meat which she had to chop. She soon fell ill, and died in five weeks. Her bowels contained swarms of adult trichinæ, and the voluntary muscles throughout her entire body were colonized by myriads of larvæ. It appeared on inquiry that other persons who took part in slaughtering the same pig also suffered; and that, though none died, two were bedridden for weeks. Microscopical examination of products which were remaining of the slaughtered pig—ham, sausages, and black puddings—showed in them innumerable dead trichinæ. While the present report is being printed, a contemporary number of Virchow's Archiv (vol. 27, p. 421) contains a paper by Dr. C. Tüngel of Hamburg, giving particulars of a case in which certainly one death was caused, and perhaps also a second death, as well as some not fatal illness, by the consumption of trichinous pork on board ship. Of the two deaths, one occurred on the 24th, the other on the 27th day after that on which the pig was slaughtered, and the consumption of its flesh begun.—July, 1863.—J.S.

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fever, have died in consequence of the meal; but, on the other hand, M. Renault—formerly Director of the Imperial Veterinary College at Alfort—is quoted,* as believing that meat from carbuncular animals is harmless. It seems to me that in this question, which concerns so many diseases and so many different stages of disease, somewhat extensive investigations are wanted, to fix accurately the limits between safe and unsafe consumption. But that human life may, under some circumstances, be endangered through the use of cooked meat derived from animals with anthrax, seems to be conclusively shown by the following case, with which Mr. Keith, Senior Surgeon of the Aberdeen Royal Infirmary, has favoured me. "In the first week of November 1840, on the farm of "Mr. G——, near K——, in Aberdeenshire, a two-year old "quey was observed to be unwell, supposed to be threatening "the 'quarter-ill.' She was in consequence slaughtered by the "ploughman, aided by a neighbouring blacksmith. On skinning the animal the flesh generally presented a healthy aspect, "except that here and there, round, black, ecchymosed spots, "quite circumscribed, were visible over the carcase. When "these patches were cut out the meat seemed so healthy to "look at, that the owner resolved to salt it down as his "winter mart, a portion of the animal being reserved for "present use. A boil of this beef was cooked next day in a "pot of broth to dine the whole family, consisting of 11 individuals—father, mother, six grown-up sons or daughters, "an aunt, horseman, and housemaid. Of the 11, two, viz. "the father and the servant, did not partake of either the "beef or the broth, and these both remained well, while the "other nine who partook more or less largely of both were "soon after seized with such alarming symptoms of poisoning "that a medical man was at once called in. The symptoms "he found most urgent were dead sickness, with vomiting, "great prostration of strength, soon followed by looseness of "the bowels. By active evacuants, followed by the free use of "stimulants, and that succeeded by quinine, seven recovered

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* *See* Virchow in his Handbuch der Pathologie und Therapie, vol. ii. p. 97. *See* also Chevallier, Dictionn. des Altérations et Falsifications des Substances Alimentaires Médicamenteuses et Commerciales, vol. ii. p. 55.—J.S.

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" in a few days, but one daughter died on the fourth day, and " the mother sank on the fifth, both in a typhoid state. On " the 12th of November 1840, the ploughman, James Robertson, who slaughtered the said cow, and the blacksmith, " Alexander Andrews, who assisted him, were admitted into " the Royal Infirmary of Aberdeen, under the care of Dr. " Keith, both labouring under phlegmonous erysipelas of one " arm each, with high fever and delirium. No wound or open " sore could be detected on the ploughman's hand or arm to " account for inoculation, but it was surmised that he had " partaken of the meat; but in the case of the blacksmith, " who had not tasted the meat, he pointed to a large malignant pustule on the knuckle of his left, much swollen " thumb, and stated that he had cut that knuckle while in " the act of skinning the cow. Gangrene seemed imminent " in both arms, from the finger tips to the axilla, vesications " having already risen at various places; free and deep incisions instantly relieved tension; hœmorrhage from the " cut vessels soon subdued the febrile excitement. One smart " calomel purge, and then recruiting. The one was dismissed " cured at the end of 22, and the other at the end of 26 days. " These parties communicated the whole circumstances of the " case to the writer, and already, before they came to the " hospital, the two victims were dead. It was further stated " that the offal of the cow was cast into a dung-hill, to which " two grown swine had access. These ate of it freely, were " taken ill, and both died. These facts are to depend on. " The one point on which I am in doubt is as to whether it " was the mother or the aunt that was the second victim; but " that two died there is no doubt. The affair created a great " sensation in the district, and has hindered the repetition of " any similar occurrence; but it is to be feared it has also led " to the more early disposal of the sick cattle for slaughter, " to be sent off to some distant market." In a letter of further information which Mr. Keith has been good enough to write to me, answering various questions I had asked him, he says:— " I learn that the meat cooked was quite fresh, and healthy " to look at, and that the fatal dinner was cooked *on the very " day the animal was killed*, so that putrescency had nothing

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" to do with the matter. I further learn that one of the " females—the servant—had suspicion that it might not be " safe to eat of the meat, and therefore it was that she " abstained, and was safe, as already stated. The father " habitually abstained from animal food, and did so that day " and escaped. One other of the females only took of the " broth, and no beef, and escaped more easily than any of the " others."*

(*c.*) As regards possible ill-effects from consuming, in a well-cooked state, the flesh of animals which have been suffering an *infectious fever*,—small-pox, typhoid fever, pleuro-pneumonia, or aphtha,—I have no inculpatory evidence worth quoting. And as regards the last two diseases, common as they are in this country, I am of opinion that the absence of evidence is enough to show that immediate ill-effects of any considerable importance do not ordinarily follow the consumption of the meat. Indeed it is certain that on various occasions meat of this description has been consumed on so large a scale that, if the meat had been immediately hurtful, the consequent mischief could not have escaped observation.† On the other hand, I must repeat that, till public attention is drawn to such subjects as these, it is difficult to prove connexions, which afterwards become evident, between evils and their latent causes. And particularly in this point of view I must advert again to the unexamined part of this question,—the doubt whether chronic ill-effects (which of course would be singularly difficult to trace) may perhaps result, when febrile meat—meat which necessarily is of modified chemical constitution—becomes a considerable element in diet. An opinion is sometimes expressed, that boils (perhaps with other like

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* Many cases, less circumstantially stated, but generally to the same effect as the above, may be found scattered in journals of veterinary medicine, especially in those of Germany, for the last few years, as well as in older publications. And cases are comparatively numerous where birds, dogs, pigs, and cats have died after taking even small quantities of the blood or offal of recently-slaughtered carbuncular animals.—J.S.

† See instances, in the section which relates to food in Lévy's *Traité d'Hygiène.* —I am informed that some years ago during an epidemic of cattle-typhoid (rinder-pest) in Bohemia, the poor people had the habit of digging up, for food, the carcases which the authorities had had buried, and that no harm was observed to result from this practice.—J.S.

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affections) are caused in the human subject by the consumption of such meat as I refer to. And though I have not yet found any fact which I can deem conclusive in support of this opinion, I must admit that the alleged connexion is not *primâ facie* impossible.

(*d.*) Before leaving the subject of cattle-diseases in their relation to the supply of meat, I must mention, as a danger incidental to the consumption of meat from diseased animals, that, in some cases, the meat may be injurious in consequence of the animal having been *excessively drugged during life.* Mr. Gamgee mentions cases, where animals recently drugged with arsenic and strychnia have been used for human food. He quotes a very striking case, reported nine years ago in Germany, to the effect that signs of poisoning arose almost as an epidemic among 321 persons who had eaten of the flesh of an ox, which during life had been dosed with tartar emetic and had had perhaps two ounces of that drug; that, of the 321 persons who ate of the ox, 107 suffered, and one of them fatally, from violent gastro-intestinal disturbance; that antimony was chemically found both in the flesh of the ox, and in the interior of the person who died; and that doses of the flesh given experimentally to other animals produced signs of poisoning. Generally it might be expected that no drugging of an animal, in doses not sufficient to poison it, could render its flesh capable of acting as a poison on man.

In conclusion, lest I should seem to have ignored any important existing evidence on the subject of the dangers which are attributable to the consumption of diseased meat, I think it right to observe that, in popular discussions of this subject, and even in some of the medical writings which relate to it, sufficient care has not, in my opinion, been taken to separate two important questions,—the question of meat's being rendered *unwholesome by decomposition,* and the question of meat's being rendered *unwholesome by disease.* Among the cases which I see adduced as illustrations of mischief from diseased meat, are some which, for aught that appears, may only illustrate the well-known fact, that, even in presumably healthy meat, poisonous properties, different from those of common putridity, are sometimes developed by decomposition.

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And although, for the interests of public health it is desirable that cases of the latter kind (and indeed all cases of alleged injuriousness of food) should receive their due share of attention, yet, for the immediate purposes of the present discussion, they must of course be regarded as irrelevant.

With regard to that minor branch of the inquiry which relates to the MILK of diseased animals—it appears that, in this country, the most important question is as to the wholesomeness of milk from *animals with aphtha.* Mr. Gamgee points out that on some occasions when aphtha has been prevailing among the cattle of a country, the human population in the same places has suffered from the same or from some similar disorder. And experiment* seems to have established as certain, that, at least under some circumstances the human affection may be caused by the consumption of milk drawn from a diseased animal. It may be† that the frequency of such communications of the disease, as compared with the number of persons who (more or less) are consumers of milk, is not great. But the danger is one of which the

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* More than 20 years ago Prof. Hertwig published particulars of such experiments performed by him on himself and two friends with the result of producing a very definite eruptive fever.—J.S.

† See, on this side of the question, the Report which was made to the Préfet of the Seine by M. Huzard fils, in 1839, when aphtha was extensively present in the Paris dairies. Among his conclusions are these:—§ 41. Quand la maladie a
" été connue à Paris comme maladie épizootique, il y avait déjà quelque temps
" qu'elle régnait ; elle était à son *maximum* sous le rapport du nombre des bêtes
" malades ; déjà le lait était consommé journellement, et cela, depuis le com-
" mencement de la maladie, sans que l'attention eût été appelée par quelque
" dérangement dans la santè publique.

" § 42. Dans les années 1810, 1811, 1834, et 1835, où la même maladie avait
" régné à Paris, il n'y avait eu aucune précaution prise pour interdire la vente du
" lait; cet aliment avait été consommé comme dans les années ordinaires, et
" aucune épidémic n'etait apparue.

" § 43. Dans les provinces où elle régne depuis le commencement de l'année
" dernière, on n'a point interdit la vente du lait, et il n'y a eu aucun accident,
" aucune affection connue qu'on ait pu attribuer à la consommation de cet
" aliment.

" § 44. Le lait des vaches malades, donné au sortir du pis, aux porcs, aux
" veaux mêmes, n'a point eu d'inconvénient pour ces animaux, et si des veaux
" ont eu la maladie, il en est qui n'en ont point été attaqués après s'en être nourris
" exclusivement pendant un laps de temps assez considérable."—See Annales d'Hygiène Publique et de Médecine Légale, vol. 22, p. 296.—J.S.

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public ought to be aware. Further inquiry is wanted to ascertain whether the allegation, which has been both made and contradicted, be true or untrue,—that the milk of aphthous cows, if used for food (especially by young children, who are likely to be the largest consumers of it) is apt to produce disturbance of the stomach and bowels.

Mr. Gamgee in sundry parts of his Report states his belief that a very large proportion of the disease which now habitually prevails among live stock in the United Kingdom, and which he estimates as proving fatal to stock to the immense pecuniary amount of "more than six millions sterling" per annum, *might by proper measures be prevented*;—viz.,—that the epidemic diseases are due entirely to contagion, originally foreign, against the introduction and spread of which our present precautions are, in his opinion, not sufficient; and that the most destructive endemic diseases are due, partly to local malaria which improved land-drainage would dispel, and partly to dietetic mismanagement of stock. Though it is not any part of my present duty to enter upon a consideration of the important questions which are here opened, I have felt myself bound to bring these parts of Mr. Gamgee's Report under their Lordships' particular notice.

From the Sixth Report to the Privy Council, 1863.

[The Sixth Report comprises a section on Vaccination which has appeared in Vol. I., pp. 361–4. There follows a long and most important section, which is given below under the uniform heading of "Distribution of Disease in England," and which in this report is dealt with under several sub-sections, viz. :—1. Conditions of Nourishment: (i.) the Food of the Poorer Labouring Classes; (ii.) the Causes of Sea Scurvy in the Mercantile Marine. 2. Hurtful or hurtfully-conducted Occupations. 3. Residence in Marsh Districts: (i.) as regards Ague and other malarious diseases; (ii.) as regards the mortality of infants. 4. Hospital hygiene in relation to Traumatic infections and the spread of contagious fevers. 5. Accidental and Criminal Poisoning, which has already appeared in the portion of Vol. I., pp. 541–50, relating to the Practice of Pharmacy in Great Britain. The report for 1863 concludes with an account of "Miscellaneous Proceedings" which had reference to outbreaks of small-pox and typhoid fever; an inquiry at Rotherham

" on account of the very exceptional occurrence of a considerable epi-" demic of jaundice;" an inquiry into an alleged endemic prevalence of tapeworm in and about Chapel Town, near Sheffield; an inquiry by Mr. Robert Ceely into the particulars of an outbreak of "anthrax fever" at Swineshead, Lincolnshire, which was of especial interest, not only as affecting several kinds of domestic animals, but also in regard of its possible relations to disease of the human subject; and several illustrations "of the circumstances under which typhoid-fever and the " other diarrhœal infections continue to be extensively prevalent in this " country."—Ed.]

Distribution of Disease in England, and the circumstances by which it is regulated.—*cont.*

Distribution of Disease, and the circumstances by which it is regulated.

For the last five years there has been in progress, under direction of the Privy Council, a systematic and continuous inquiry into the circumstances which regulate the distribution of disease in England.

My report of 1858, *on the preventability of certain kinds of premature death*, has served as a programme to the inquiry, and, from 1858 till now, the results, as far as obtained, have, year by year, been given in my successive annual reports. Sometimes the inquiry has started from known local EXCESSES OF A PARTICULAR DISEASE; and by proceedings in this form the ætiology of several of our most important diseases has been investigated;—as, for instance, of diarrhœa and diphtheria in 1859,—of phthisis and other lung-diseases in 1860 and 1861,—of diseases causing infantile mortality in 1862,—and of typhoid fever in all the years, but especially in 1860. Sometimes, on the other hand, the form of the proceeding has for convenience been that of investigating the operation of a known MORBIFIC INFLUENCE;—as, for instance, in 1862, in the inquiries into the effects of working with arsenical green, and into the effects of working with phosphorus. During the year 1863 further proceedings of both sorts were ordered by the Privy Council, and considerable additions were in consequence made to the stock of information which their Lordships had previously collected. Inquiry of a third sort—inquiry, namely, as to the sufficiency with which the primary wants of the body are satisfied among the poorest classes of the population, has been begun, and in one very important particular—the particular of FOOD, somewhat extensively

Distribution of Disease, and the circumstances by which it is regulated.

conducted. I append in extenso the reports of the several gentlemen who have acted as inspectors for those various inquiries of the Privy Council during the year 1863. And I have now to submit some few observations of my own on the several matters of inquiry.

Nourishment.

1. *Conditions of Nourishment.*

(i.) *The Food of the poorer Labouring Classes.*

Food of the poorer labouring classes.

That no sanitary necessity can be more real than the common animal need of proper food,—that no morbific influence can be of worse import to life than mere privation of nourishment,—these are propositions which everyone feels to be true, when they are illustrated in individual cases of death by starvation, or in those national extreme sufferings of scarcity which constitute famine. But the propositions are not exclusively true in that utmost range of their application. In degrees far short of what is popularly known as starvation or famine, insufficiency of nourishment may bring very hurtful consequences to health. Local defects or local peculiarities of diet may exercise important influence in determining or colouring particular localisations of disease. And generally it may be said, that in order justly to estimate the sanitary circumstances of a people, scientific regard must be had to the quantity and quality of the people's meat and drink.

It was in this point of view that my Lords, in 1863, thought it desirable to order an inquiry to be made into the dietaries of our lowest-fed populations. The inquiry which their Lordships had made in 1862 into the nourishment of the distressed operatives in Cheshire and Lancashire had not only made obvious an existing want of general information with regard to the dietaries of the poor, but had also well shewn the principles on which such information could best be collected and generalized:—and Dr. Edward Smith, who had made that former inquiry for their Lordships, was the gentleman whom under their orders I instructed to make the present more general one.

The inquiry was (like all their Lordships' inquiries) essentially for the purposes of England. But, even for these

Food of the poorer labouring classes.

purposes, some exterior standards of comparisons were wanted. And accordingly, just so far as was necessary for that end, information was sought also in Scotland and in Ireland. The number of households visited was, in England and Wales 553, in Scotland 29, in Ireland 52. In 125 cases (all English) the inquiry related to the poorer classes of in-door work-people,—silk-weavers, needlewomen, glove-stitchers, stocking-weavers, shoemakers, &c., who, almost entirely, were town-residents. In nearly all the remaining 509 cases, the inquiry related to farm-labourers.

This statement of numbers will sufficiently show that the inquiry did not pretend to be exhaustive. Indeed, for obvious reasons, it could but be an examination of *samples;* and in such an examination (exceedingly small, of course, in proportion to the entire mass which has to be judged about) the trustworthiness of the results depends entirely on the degree of success attained in finding samples which are thoroughly typical. Having regard to the dimensions of the inquiry, I cannot venture to say that such success has in every instance been quite perfectly attained; but adverting to the precautions which Dr. Smith took in this respect (and which he describes in the commencement of his report) I feel assured that every selected case may be deemed representative of considerable numbers of families, and that therefore the results of the inquiry may at least be accepted as true for large masses of population.

The results of the inquiry are not so much for any present separate application, as for use, connectedly with other facts, in future sanitary judgments. But while for this reason I may now well leave without comment most of the collected information, there are yet some parts of it to which I would draw attention, as, in my opinion, of more immediate public interest.

As the inquiry specially related to the feeding of our lowest-paid labouring classes, it was to be expected that evidence of very poor diet would often be met with. And such proved to be the fact. Throughout some of the examined classes, and in appreciable sections of the remainder, the diet was (to say

Food of the poorer labouring classes.

the best of it) of doubtful permanent sufficiency for health. For the examined agricultural populations, the diet was not so poor as for the examined in-door operatives. In both classes, of course, poverty was found to tell least upon those who were without families. And in both classes, but very especially among the agriculturists, insufficiency of food does not nearly so much affect the married labourer as it affects his wife and children. For he, in order to do his work, must eat. Particularly if the agricultural labourer be fed at his employer's house, and most of all if he (being unmarried) lives there, he will commonly fare well. Even sometimes, when thus circumstanced, he will feed to excess. But at least the wives and children of the examined agricultural populations, and doubtless, to some extent, even the labourers themselves, are in some counties miserably fed. The worst deficiencies, however, were found among the examined classes of in-door operatives. They, taken as a whole, are so ill-fed that assuredly among them there must be many instances of severe and injurious privation.

Dr. Smith's former report, made at the time when most public alarm was felt for our unemployed operatives in the cotton towns, contained a theoretical estimate of the minimum quantity of food on which human life could reasonably be expected to subsist, and that estimate formed the scientific basis for such advice as was given to the cotton towns on the subject of their allowances for the poor. Its purport was, that, in order to avert starvation-diseases, an average woman's daily food ought to contain at least 3,900 grains of carbon with 180 grains of nitrogen, and an average man's daily food at least 4,300 grains of carbon with 200 grains of nitrogen,—i.e., for the woman about the same quantity of the nutritive elements as is contained in two lbs. of good wheaten bread, and for the man about a ninth part more. Taking the mean of the two allowances, male and female, the estimated weekly need of an average adult would be for at least 28,600 grains of carbon and 1,330 grains of nitrogen. It will be observed (see annexed table) that, in only one of the examined classes of in-door operatives, did the average nitrogen-supply just exceed, while in another it nearly reached, the estimated

Food of the poorer labouring classes.

Class.	No. of Families Examined.	Average Weekly Supply for each Adult.	
		Carbon.	Nitrogen.
Silkweavers - - -	42	27,620	1,151
Needlewomen - - - - -	31	22,900	950
Kid-glovers - - -	10	28,623	1,213
Shoemakers - - - - - -	21	31,700	1,332
Stocking-weavers - - -	21	33,537	1,316
Average - - - - -	- - -	28,876	1,192
Minimum Allowance advised for unemployed Cotton Operatives - -	- -	28,600	1,330

standard of bare sufficiency, and that in two classes there was defect—in one a very large defect—of both nitrogen and carbon. Moreover, as regards the examined families of the agricultural population, it appeared that more than a fifth were with less than the estimated sufficiency of carbonaceous food, that more than one-third were with less than the estimated sufficiency of nitrogenous food, and that in three counties (Berkshire, Oxfordshire, and Somersetshire) insufficiency of nitrogenous food was the average local diet.

Of course I do not insist on the grains of this comparison. The estimate which serves as the standard for it was, I repeat, a theoretical estimate. Even in that sense it was never deemed more than approximative and provisional; nor could any theoretical estimate be deemed superior to correction from results of actual observation. But, taken for what it is, taken as the scientific, though necessarily imperfect estimate, made only some eighteen months ago, of what quantity of food might on an average just suffice to "avert starvation "diseases," it has some significance as a standard. Moreover, at the time when it was made, it had this sort of practical corroboration,—that apparently it agreed very nearly with the very scanty amount of nourishment to which the unemployed operatives under pressure of extreme distress had actually reduced their consumption of food. And now, if averages be looked to, the present empirical results are not inconsistent with it; for, with the mass of examined in-door

Food of the poorer labouring classes.

operatives, where alone the average food consumption of considerable numbers of persons was found below that standard of comparison, the average state of health was unsatisfactory.* To this fact, however, if it stood alone, I should not impute any degree of conclusiveness, as proof of disease resulting solely from scantiness of nourishment. Had the inquiry aimed at the collection of such proof, much larger numbers of extreme cases must have been observed, and minute regard must in each case have been had to details of bodily health, and to other sanitary circumstances than the single influence of diet. That cases are innumerable in which defective diet is the cause or the aggravator of disease, can be affirmed by any one who is conversant with poor-law medical practice, or with the wards and out-patient rooms of hospitals. But the present materials do not pretend to be proof in that particular. They may be regarded as simply expressing the dietetic habits (apart from the sanitary state) of that part of the labouring population which is habitually least above destitution.

Yet in this point of view there is, in my opinion, a very important sanitary context to be added. It must be remembered that privation of food is very reluctantly borne, and that, as a rule, great poorness of diet will only come when other privations have preceded it. Long before insufficiency of diet is a matter of hygienic concern, long before the physiologist would think of counting the grains of nitrogen and carbon which intervene between life and starvation, the household will have been utterly destitute of material comfort:—clothing and fuel will have been even scantier than food,—against inclemencies of weather there will have been no adequate protection,—dwelling space will have been stinted to the degree in which over-crowding produces or increases disease,—of household utensils and furniture there will have

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* And it must be remembered that Dr. Smith, for reasons which he states at the beginning of his report, made it one of the rules for his selection of sample-families, that the health of the families should, as far as was known, be good. It may be that if this rule had not been acted on, the sanitary complexion of the evidence would have expressed far more privation than it does. But the form of the inquiry must then have been entirely altered, and the main object of the inquiry could not have been equally well attained.—J.S.

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been scarcely any,—even cleanliness will have been found costly or difficult, and if there still be self-respectful endeavours to maintain it, every such endeavour will represent additional pangs of hunger. The home, too, will be where shelter can be cheapest bought;—in quarters where commonly there is least fruit of sanitary supervision,—least drainage,—least scavenging,—least suppression of public nuisances,—least, or worst, water supply,—and, if in town, least light and air. Such are the sanitary dangers to which poverty is almost certainly exposed, when it is poverty enough to imply scantiness of food. And while the sum of them is of terrible magnitude against life, the mere scantiness of food is in itself of very serious moment. From such degrees of it as Dr. Smith found existing among the lowest fed of the examined classes, there must, I feel assured, be much direct causation of ill-health, and the associated causes of disease must be greatly strengthened by it in their hurtfulness. These are painful reflections, especially when it is remembered that the poverty to which they advert is not the deserved poverty of idleness. In all cases it is the poverty of working populations. Indeed, as regards the in-door operatives, the work which obtains the scanty pittance of food is for the most part excessively prolonged. Yet evidently it is only in a qualified sense that the work can be deemed self-supporting. All disease of such populations, and whatever destitution results from it, must be treated at the public expense; and on a very large scale the nominal self-support can be only a circuit, longer or shorter, to pauperism.

Also, it seems to me that, where higher degrees of plenty exist, there, very important drawbacks are to be counted. If the wife has been earning money, she has been withdrawn more or less from her housekeeping and motherly duties:—and I must say that, the more knowledge I get of the sanitary circumstances of the poor, the more reason I find for dreading any considerable development of that mode of increasing income. Or, if the children have been earning money, they probably have been more or less withdrawn from opportunities of rudimentary education. In either case

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(and of course often both cases concur in the life of a single household) a better present livelihood is got;—but the price paid for it is in effect a mortgage on the future of the family,—a mortgage which is almost sure to result in the family's eventual deterioration. Particularly I must advert to the lamentable moral (as well as physical) consequences which tend to ensue on various industrial employments of adult women;—a subject which has been in part treated in my Fourth Report, and will now again be strongly illustrated by facts which I have presently to bring forward.

How far (if at all) the described circumstances of our poorest labouring population tend to better themselves, and how far (if at all) they may be bettered by interference from without, are questions which cannot be discussed without reference to parts of political economy on which I am incompetent to speak. Indirectly, indeed, those questions are of the vastest sanitary importance:—for the "public health" of a country means the health of its masses, and the masses will scarcely be healthy unless, to their very base, they be at least moderately prosperous. And although the satisfactory solution of those questions is a task for other sciences than the science of medicine to fulfil, yet assuredly, if that solution can be given, the ultimate result will be among the foremost gains which a department of public health can have to record.

Meanwhile, however, there are some parts of Dr. Smith's report to which I would particularly refer, as showing how much better is the state of the agricultural population in some parts of the country than in others, and as tending to show what are the favourable influences in determination of such superiority.

Especially I would advert to the indications which his report contains of the great value of cottage gardens, and to the causes which he assigns for the extensive non-consumption of milk among our agricultural population, and to the remarks which he makes on deferred payment of wages and on disadvantageous allowances of drink. And, in another point of view, I would with equal urgency advert to the

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considerable differences of economy which there are, and this in town as well as in country, between different poorly nourished households,—to the many illustrations which there are that sensible improvements of the family feeding might be made if but the small economics of diet were understood. Such passages as those to which I refer will show how the poor may most effectively be assisted by others, and how they may most effectively help themselves. Above all, perhaps, it is important that the employers of labour, and the better off classes generally, should understand how many forms of help there are which represent money's worth to the recipient without representing money's loss to the giver. Dr. Smith's report abounds with illustrations of this; and there is one other which I will venture to name. Often the most permanently useful form of help which the better-off classes can afford to the poorest will be the mere imparting of information. For surely the poor man will best succeed in helping himself when he shall have most knowledge appropriate to his circumstances;—not alone when he shall have learnt how to obtain without wasteful purchase or wasteful cookery the fullest vital value for his scanty spendings on food; but perhaps even more, when he shall also have learnt the full economical meaning of the unwholesome and degrading uncleanliness amid which he is now often condemned to live or die,—when he shall have learnt what false thrift there may often be in sending forth wife and untaught children even to bread-winning labour,—and when, with ambition to aim at higher standards of life for himself and for them, he shall be enabled to compare his own local earnings and struggles with those of other sections of the world's proletariat, and in such comparisons shall have the means of judging for himself where is the best market for his special industry, and what are the best terms which, singly or with other men, he can get for it.

In reference to some of these questions, it is of interest to advert to the wide differences of nourishment obtained by agricultural labourers in different parts of the United Kingdom,—differences which are in great part due to actual differences of prosperity, and which in other part are due

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to differences of an important kind in the dietetic habits of the people. Thus, so far as the present report furnishes materials for comparison between different parts of England, the food of the agricultural population is in some counties 50 per cent. better than in others. Compare, for instance, in the annexed table, the quantities of the nutritive elements contained in the apparently average dietaries of Northumberland, Westmoreland, Warwickshire, Suffolk, Durham, Berkshire, Oxfordshire, and Somersetshire respectively. The differences here illustrated probably represent, though of course not exactly, differences of labouring prosperity; but the effect of difference of dietetic habit may be shown by comparing with one another the four divisions of the United Kingdom in respect of their agricultural populations. So far as the present materials suffice for the making of such comparisons, it seems that, of the divisions of the United Kingdom, England is considerably the worst fed. A very important difference is, that the agricultural labourer gets in England only a quarter as much milk as in Ireland or Scotland. In Ireland too the bread-stuffs are more than half as much again as in England. And Scotland, which stands lower than Ireland in bread-stuffs, is enabled (thanks in part to its braxy mutton) to exceed Ireland considerably in meat. In Wales there is a third less milk than in Scotland or

Quantities of carbon and nitrogen weekly consumed by an average agricultural adult in the undermentioned counties of England.

Counties for Comparison.	Carbon. grs.	Nitrogen. grs.
Northumberland - -	48,648	2,034
Westmoreland - -	42,149	1,908
Warwickshire - - -	47,557	1,732
Suffolk - - -	47,064	1,744
Durham - - - -	44,589	1,862
Berkshire - - -	37,059	1,193
Oxfordshire - - -	35,651	1,322
Somersetshire - -	33,832	1,290

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Ireland, but there is cheese to make up for the difference. And the broad results, stated according to the chemical elements contained in the respective divisional dietaries, are those which the annexed table represents.

Quantities of carbon and nitrogen weekly consumed by an average agricultural adult in each of the four divisions of the United Kingdom.

Divisions of the United Kingdom for Comparison.	Carbon. grs.	Nitrogen. grs.
England - - -	40,673	1,594
Wales - - -	48,354	2,031
Scotland - - -	48,980	2,348
Ireland - - - -	43,366	2,434

(ii.) *Causes of Sea-Scurvy in the Mercantile Marine.*

Sea-Scurvy of Merchant Seamen.

To one particular disease of defective nourishment—to the so-called scurvy which results from absence of vegetable food, their Lordships during 1863 thought it expedient to give separate consideration. Their Lordships indeed knew that our general population does not now suffer any appreciable detriment from that entirely preventable and almost entirely prevented disease. But their Lordships also knew that scurvy, notwithstanding its entire preventability, is still sometimes to be found, under very censurable circumstances, among a class of persons whom the law purports specially to protect from it. They knew, namely, that to some uncertain extent, and as the result of illegal neglect, it was still occasionally occurring in the Mercantile Marine. And in order that they might have before them all attainable data for estimating the degree to which the evil prevails, I under their direction requested Dr. Robert Barnes, Physician to the Hospital Ship "Dreadnought," to report such information as he had, or could collect, with regard to the prevalence, and the circumstances of prevalence, of scurvy among sailors in the Merchant Service.

Dr. Barnes's report shows that, of the entire number of men received into the Stranger's Home at Poplar, nearly half are,

Sea-Scurvy of Merchant Seamen.

at the time of their admission, suffering more or less from scurvy, and of these perhaps a twentieth part seriously diseased with it;—that, of the entire number of cases admitted during the last twelve years into the Hospital Ship "Dread-" nought," cases of scurvy have formed a twenty-fourth part;—that to these must of course be added sufferers who are not taken into such establishments as the above—"a large but " uncertain number of cases taken into the low lodging-houses " of the water-side";—but that this is for London alone, and is not nearly all due to London shipowners;—that, of 86 cases of scurvy treated in the "Dreadnought" during 1863, only 14 came from ships which had issued from the port of London, while 31 came from foreign ships, 21 from Liverpool ships, 8 from Sunderland ships, and 12 from Glasgow and other British ships;—that Liverpool ships, besides furnishing to London a large proportion of the scurvy which is treated here, convey probably a much larger quantity of the disease to their own port of departure,—that, at all events, during 1863, 50 cases (all probably severe) were admitted at the Liverpool hospitals, and during 1862 a dozen cases at the Glasgow and Greenock Hospitals;—that shipowners of Liverpool and other northern ports, and of Hamburg and America, are those who " exhibit the greatest amount of disregard of the safety and " health of their crews. The plight in which the poor sailors " from certain services are admitted is pitiable to witness. " Disabled by hardship, semi-starvation, and ill usage of " every kind, they are cast out with the same indifference " with which a worn-out block would be thrown overboard."

Apart from the not insignificant question here raised of cruelty from master to servant, there is another question raised by Dr. Barnes as deserving of public consideration. "When it is " remembered that the security of this country has on several " occasions been imperilled by the disablement of the Royal " Navy through scurvy, it may be presumed that the same " cause will imperil the safety of our merchant ships. And " there can be no doubt that many ships have actually " foundered at sea because the crews were so prostrate from " scurvy as to be unable to handle them when overtaken by " severe weather. It has been the custom to inquire what

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" proportion of the crews were disabled by scurvy. As might " be supposed, in the case of a disease resulting from a cause " operating upon the entire crew, this proportion is often very " large. Thus there were recently admitted on board the " 'Dreadnought' 12 cases of severe scurvy from one ship; " two others were known to be seriously affected; and the " entire complement of officers and men was only 19, leaving " but five men in all able for duty to work the ship. Similar " cases are not uncommon. It will be seen from Supplement " C., that the proportion of the crew disabled has ranged " from 20 per cent. to 70 per cent. It is certain that scurvy " ships have rarely a hand to spare. Deprive such ships of a " fourth, a half, or two-thirds of their force, and the peril of " ship, cargo, crew, and passengers in stress of weather is " obvious. A crew of five men, for example, could not reef " topsails or bring the ship to in a gale of wind. And it " must not be forgotten that where scurvy has prostrated a " large part of the crew the vigour of the remainder is sure to " be sapped, so that there may not remain a single sailor before " the mast in a state of thorough efficiency. It cannot be " doubted, further, that scurvy, being one result of the reck-" lessness of owners and captains in regard to the health and " lives of seamen, is a great cause of demoralisation among " sailors. This in itself is a serious evil."

It is unnecessary for me to justify in much detail the assumption with which I started, that scurvy is an entirely preventable disease. Privation of vegetable food is its one essential cause. The giving of vegetable food is its one essential counteractive. This fragment of the science of preventive medicine is now well known to all the world. It was scurvy which used to decimate our navy, and render long sea voyages almost impossible;—it was mainly by scurvy that Anson in his celebrated voyage of 1740–2 lost, within the first 10 months, nearly two-thirds of his crew, and during the remaining period about half of the survivors;—and it was against scurvy that Cook had attained his triumphant success, when in 1775, after three years' absence, he brought back a healthy crew which out of 112 men had lost only one by disease. Cook's great example gradually got to have its due weight. Twice, indeed, Sea Scurvy of Merchant Seamen.

in the next 20 years, our Royal Fleet had scurvy enough to endanger its existence. But then the better knowledge and better practice began to make effectual way. The year 1796 was (says Sir Gilbert Blane) marked "as an era in the "history of the health of the British Navy," by the general introduction of lemon juice; and an illustration of the effect of this change is that at Haslar Hospital, which even in the year 1780 received 1,457 cases of scurvy, scurvy is now an almost unknown disease.*

On what circumstance then does it depend that scurvy, to a noticeable amount, is still found in the Merchant Service? Surely not from ignorance;—for the ships which show how to produce the disease show also how to prevent it;—"Scurvy "(says Dr. Barnes) may be prevalent in the forecastle, but it is "never known in the cabin; if the captain and mates know "how to preserve themselves, they know how to preserve "their men."

The one thing wanted in order that scurvy should be entirely banished from the Mercantile Marine, is proper provision for the dietary of the crew;—such provision as is enforced in emigrant ships,—where each person's weekly allowance must have in it at least 8 oz. of preserved potatoes and 3 oz. of other preserved vegetable (carrots, turnips, onions, celery, and mint) besides pickles and 3 oz. of lime juice,—where also there is considerable variety of bread-stuff, and where, on two days of the week, preserved (not salted) meats must be given. With such a dietary as this, the details of which might be varied, provided its principle were adhered to, the occurrence of scurvy would be impossible. And even with dietaries

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* In the middle of the 17th century the deaths by scurvy in London averaged about 30 per annum, but in particular years the average was greatly exceeded. For instance during the years 1655–9 they averaged 86, and in the great plague-year were 105. That amount of land-scurvy, and doubtless a far larger amount in more distant times, depended on the same causes as those which still develop sea-scurvy. Vegetable food was as yet so little cultivated, and the animal food consumed in winter was to so great an extent salt-meat, that perhaps the landsmen of those days were not better off than the seamen of these. It is said that the most common articles of the kitchen garden, such as cabbage, were not cultivated in England a century ago, and that in Tudor times Queen Catherine of Arragon could not procure a salad till a gardener came from the Netherlands to raise it for her.—J.S.

Sea-Scurvy of Merchant Seamen.

inferior to that just described, scurvy would not occur as it does, if but the provisions of the Merchant Shipping Act (17 & 18 Vict. c. 104) were obeyed—that whenever a crew shall have been consuming salt provisions for 10 days, lime or lemon juice and sugar shall be served out at the rate of half an ounce each per day,—and if during the voyage the opportunities which offer themselves were fairly used for getting new supplies of fresh animal and vegetable food. But in both respects there is default. Owners disobey the law, and captains neglect opportunities to cure the results of this disobedience. Owners, notwithstanding the law, will send forth their ships on long voyages without any provision of lime juice or with lime juice insufficient in quantity, or with lime juice of which the quality is bad; and "captains, with " half their crews more or less disabled, are known to run past " St. Helena or the Western Isles when a few hours' delay " would obtain sufficient provisions to repair the mischief " occasioned by first neglect."

After carefully considering the statements made in Dr. Barnes's report, I concur with him in thinking that the intentions of the Merchant Shipping Act, so far as concerns the prevention of sea-scurvy, are not likely to be altogether realized unless particular inspectional regard be had to breaches of the Act. Probably it might without much inconvenience be arranged that, in every case of the arrival of a ship from a long voyage, the inspecting officer of customs should take means to ascertain whether there be or have been any scurvy on board, and that if thus or otherwise it should appear that scurvy has been prevailing, inquiry under the Merchant Shipping Act should be held whether a punishable offence under that Act had been committed. And assuredly, in every case of death occurring in this country from sea-scurvy contracted on board ship, it would be desirable that a coroner's inquiry should be made into the circumstances under which the disease had arisen.

2. *Hurtful or hurtfully-conducted Occupations.*

Industrial diseases.

Employments which injure the health of the employed may be injurious in either of two ways, and may accordingly

Industrial diseases.

be considered as divisible into two classes. In the one class, the work is naturally unwholesome, and, except in so far as its natural unwholesomeness can be and is counteracted by artificial contrivances, the employed must suffer in health. In the other class, the work is not naturally injurious to health, but becomes injurious by reason of the mode in which it is carried on. Illustrations from each of these classes have been given in my former reports; and during the past year further illustrations of both have been gathered.

Workers in Lead and Mercury.

(i.) As regards the first class of work—the work which *naturally* endangers health,—the inquiries previously made and reported on have related to mining of all sorts, and to the various dust-producing in-door industries, and to the industries concerned respectively with phosphorus and with arsenic-green;—and now, in continuation, my Lords have had inquiry made by Dr. Whitley into the industries which have to do with LEAD, and into the industries which have to do with MERCURY.

It has long been well known that any person, whose employment brings him into much habitual relation with either of these metals, is liable to a process of slow poisoning; which in its earlier stages seldom (except with extreme neglect) proves dangerous to life; but which, if the employment be persevered in, is apt with time to get faster and faster hold of the body, and at last to cause irreparable disease, usually in some part of the nervous system. Therefore, in their Lordships' investigation, it was a primary object to ascertain as far as possible to what extent lead-poisoning and mercury-poisoning now arise among persons who have most to do with these metals respectively. But unfortunately (for reasons which are set forth in Dr. Whitley's report) full and precise information on this subject could not be got. And any statements which can be founded on my present evidence must be qualified by two considerations;—first, that statistics were never obtainable as to the real pressure of disease on persons employed in the more dangerous branches of the industry; and, secondly, that in all probability the establishments which were visited were very favourable specimens of this class. With these qualifications, the main facts of the case are, I believe, as follows:

Workers in Lead and Mercury.

a.) As regard LEAD,—it seems to be recognized that among operatives who have to do with it only in minor degrees or under mitigating circumstances (as, for instance, among glass-makers, enamellers, shot-makers, printers, and typefounders) poisoning, sufficiently severe * to attract notice, is now rare, except for persons of intemperate and uncleanly habits.† Even with plumbers and painters it is not, except by their own fault, much more frequent. In the larger lead industries—the *manufacture of white lead*, and the *manufacture of sugar of lead*, the danger is evidently too great to be entirely within control of personal cleanliness, and perhaps too great to be in any way altogether remediable, while the present processes of manufacture continue. But one of those industries—the manufacture of sugar of lead, is little, if at all, followed in England. And respecting the other (though Dr. Whitley could not get any very exact information on the subject) it seems probable that, except with personal carelessness, damage to life is not often great; that, for all the operatives, scrupulous personal cleanliness greatly diminishes the danger; and that even the most endangered persons—those, namely, whose employment lies in an atmosphere containing considerable quantities of lead-dust, and who get poisoned rather through their mouth than through their skin, might, by the special precaution of using respirators, avert much, perhaps nearly all, of whatever suffering now results from their occupation. Universally

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* It deserves notice, that among the less prominent effects of chronic lead-poisoning a peculiar liability to *gout* has to be counted. Dr. Garrod's valuable observations, establishing this fact, are not hitherto so commonly known as to have led to any publications of experience with regard to the prevalence of gout among classes of artisans. Nor did Dr. Whitley obtain any important information on the subject. But in the Appendix it will be seen that Printers, who now most rarely (if ever) suffer from either lead-colic or lead-palsy, are reported by Dr. Smith to speak of gout as comparatively frequent among them.—J.S.

† I am not able to say whether intemperance has any direct influence in promoting empoisonment by lead, or only acquires the reputation of that influence through the frequency with which it implies careless and uncleanly habits of life.—J.S.

Workers in Lead and Mercury.

it is alleged that progress has been made in diminishing the dangers of the occupation,—progress both in improving the ventilation of workplaces, and in the adoption of personal cleanliness by workpeople; and that, as the result, there has been a great diminution of lead-disease. But in my opinion it deserves more particular consideration than it has yet received, whether the processes which diffuse lead-dust, and which occasion the chief danger of this industry, are not processes which ought to be discontinued or modified.

b.) The industries which have much to do with MERCURY are in this country happily but two,—the business of so-called *water-gilding* (a business which tends to be superseded by the innocuous process of electro-plating, and which fortunately even now exists but in small amount) and the far larger business of *mirror-silvering.* In both these industries, but especially in the first-mentioned of them, serious danger to health is, I fear inevitably, involved. But the degree of danger varies, with an unusually extensive range, according to special sanitary circumstances, — becoming enormous when the occupation is pursued in confined ill-ventilated spaces, and when the workpeople neglect personal cleanliness, but under opposite circumstances becoming at least comparatively small. In view of this fact, it is important to observe that water-gilding and mirror-silvering are not carried on exclusively in such large establishments as were visited by their Lordships' inspector, but are to some extent carried on in ordinary dwelling-houses, where, doubtless, if they could be visited, the worst results of mercurial industry might be found.

Both these metallic industries are, in their hygienic relations, generally comparable to the arsenic-industry of which I spoke in my last report. And the same sort of regulation as I suggested to be desirable for that industry would in my opinion be desirable for these;—viz., that employers should be bound to provide all practicable arrangements for lessening danger to their workpeople, and should be prohibited from employing any person who presents, even in ever so small a degree, any sign of the characteristic metallic poisoning.

Indoor Workers generally.

(ii.) As regards the second class of industries, the illustrations which stand in my former reports were gathered from the most varied industrial fields;—from the lives of straw-plaiters, lace-makers, and glovers at Berkhampstead, Tring, Towcester, Newport Pagnell, Nottingham, Radford, Basford and Yeovil; from the lives of watch-makers at Coventry; from the lives of button-makers, jewellers and various knick-knack-makers, at Birmingham and Sheffield; from the lives of stocking-makers, especially such of them as work with the old knitting-frames, at Leicester, Nottingham, Radford, Basford and Hinckley; from the lives of pottery-artisans, especially of the decorators of earthenware, at Stoke and Wolstanton; from the lives of factory operatives employed on cotton, silk, flax, and wool, at Preston, Leeds, Bradford, Pateley Bridge, Macclesfield, Leek, Stroud, Melksham, Coventry and Blackburn, and of operatives, not under the Factory Act, employed at some of these places in particular branches of the same industries.

And the concurrent testimony of these most various illustrations is,—that commonly, when many persons are employed together at any in-door industry, the ventilation of the work-place is likely to be so bad as to convert the employment, which perhaps in its own nature is not of hurtful tendency into an employment seriously dangerous to health. Here (as I anticipated in my report of 1858) lies the explanation of a fact most deplorable for the working classes of our country,—that, *in proportion as the people of a district are attracted to any collective in-door occupation, in such proportion, other things being equal, the district death-rate by lung-diseases will be increased.* For the bad ventilation which, as a rule, belongs to the place of employment, tends to develop among the workpeople a large excess of phthisis, and probably also some excess of other fatal lung-disease. And probably in all England there is no exception to the rule, that, in every district which has a large in-door industry, the increased mortality of the workpeople is such as to color the death-return of the whole district with a marked excess of lung-disease. The mortuary statistics, recently laid before Parliament, place this matter in a singularly striking light. In those returns, for instance, it may be seen, that while

Indoor Workers generally.

about 100 deaths by phthisis and other lung-diseases are occurring in various agricultural districts of England among men aged from 15 to 55, there occur, on similar masses of population, in Coventry 163 such deaths, in Blackburn and Skipton 167, in Congleton and Bradford 168, in Leicester 171, in Leek 182, in Macclesfield 184, in Bolton 190, in Nottingham 192, in Rochdale 193, in Derby 198, in Salford and Ashton-under-Lyme 203, in Leeds 218, in Preston 220, and in Manchester 263*. The same sort of evidence comes out even more strongly, when (as in the annexed table) the statistics are limited to the decenniad of adolescence, and are so given, that, with regard to districts where only one sex pursues in-door industry, the death-rates of the sexes may be compared. There, for instance, it is seen,—and not any one who knows the circumstances under which girls are employed in lace-making and straw-plaiting can wonder at the fact,—that among the adolescent population of Berkhampstead, Newport Pagnell, Towcester and Leighton Buzzard, the female victims of lung-disease are more than twice as numerous as the male. And there again, in the death-rates of Leek,

District.	Nature of principal Industry pursued in the District.	Death-rates, by Phthisis and other lung-diseases, at between 15 and 25 years of age, per 100,000 of each class referred to.	
		Male.	Female.
BERKHAMPSTEAD -	Extensive female employment in straw-plaiting -	219	578
LEIGHTON BUZZARD -		309	554
NEWPORT PAGNELL -	Extensive female employment in lace-making -	301	617
TOWCESTER -		239	577
YEOVIL -	Extensive female, with some male, employment in glove-making -	280	409
LEEK - -	Extensive employment, more female than male, in silk work - -	437	856
CONGLETON -		566	790
MACCLESFIELD		593	890
Standard Northern Districts - -	Agriculture -	331	333

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* In many of these districts, the local industry is to some extent injurious, as one which obliges certain operatives to breathe a dusty atmosphere. But none are such extreme illustrations of that influence as to effect the present applicability of the table.—J.S.

Indoor Workers generally.

Congleton, and Macclesfield, the same sort of sad testimony is borne (but not exclusively by the female population) as to the atrocious sanitary circumstances under which much of our silk-industry is conducted.

Thus far, with regard to the indoor-industries which were investigated in 1860 and 1861, and with regard to the new statistical evidence now given as to the unwholesomeness of the circumstances under which those industries are followed. The inquiries of 1863, ordered by my Lords in continuation of the above, related to the sanitary circumstances of three very large London industries,—that of female *dress-makers,* including in this term not only dress-makers, technically so called, but also milliners and various other workers at articles of dress,—that of *tailors,*—and that of printers. The inquiry concerning dress-makers was made by Dr. Ord, the other two inquiries by Dr. Edward Smith.

From these inquiries it appears certain that as regards the ill-ventilatedness of workplaces, the three investigated industries are no exception to the general rule of in-door employment,—that they even furnish in this respect some of the most pitiable illustrations which can be conceived of the cruel sanitary circumstances under which bread may have to be earned.

Workplaces of Printers, Tailors, and Dressmakers.

Probably no industry which has yet been investigated has afforded a worse picture than that which Dr. Smith gives of tailoring:—" Shops vary much in their sanitary conditions, " but almost universally are over-crowded and ill-ventilated, " and in a high degree unfavourable to health. Some are " found underground, either in the basement of a house, or " built like a large kennel in a small enclosed yard, and are " such that no domestic servant would inhabit. A very few " have been built as workshops for this or some other occupation, and have large rooms, with an abundance of " windows. Some consist of a whole house, with the walls " on each floor removed, a well staircase occupying the centre, " and skylights placed in the roof of the upper room. Others " are simply rooms on the upper floors of the premises, and " others, still, are single rooms, built in the rear of the " premises, and lighted and ventilated from the roof only.

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" In exceedingly few shops have there been any attempts at " ventilation, except through the windows placed at the sides " or in the roof; but in some, air-bricks have been inserted " into the wall, or a tube, with perforated zinc placed in it " upper edge, and communicating by the end with the outer " air, passes through the room, or tubes of various kinds pass " perpendicularly from the floor to the roof. The ventilation " through the windows is practically inefficient, since when " it occurs only through a moderate opening in the skylights, " and the doors are kept shut, the interchange of air is but " small, and when through a large opening in the skylight, " or through side windows placed near the operatives, the " draught cannot be borne, and some of the operatives in- " sist upon them being kept shut. Such rooms are neces- " sarily warm; but when the gas is lit, as during the day- " time in foggy days, and at night during the winter, the " heat increases to 80° and even to upwards of 90°, causing " profuse perspiration, and condensation of vapour upon the " panes of glass, so that it runs down in streams or drops " from the roof, and the operatives are compelled to keep " some windows open, at whatever risk to themselves of taking " cold." And he gives the following account of what he found in 16 of the most important West End shops:—" The largest " cubic space in these ill-ventilated rooms allowed to each " operative and the gaslight is 270 feet, and the least 105 feet, " and in the whole average only 156 feet per man. In one " room, with a gallery running round it, and lighted only from " the roof, from 92 to upwards of 100 men are employed, where " a large number of gaslights burn, and where the urinals " are in the closest proximity, the cubic space does not exceed " 150 feet per man. In another room, which can only be " called a kennel in a yard, lighted from the roof, and ven- " tilated by a small skylight opening, five to six men work " in a space of 112 cubic feet per man. Such a state is, so " far as my inquiries have yet extended, without parallel " in workshops in other trades."

The state of compositors in printing offices is not commonly so bad as this; nor, still less, that of other printers. And especially I must state that often the master printers have

Workplaces of Printers, Tailors, and Dressmakers.

taken pains to amend the ventilation of their workrooms. But from various circumstances the ventilation, even where it has been best devised, is almost invariably unsuccessful;—often because the building is so constructed as to be quite unfit for any large industrial use,—often because the ventilators are so arranged that the compositors are unable to bear the draught of cold air which comes from them,—often because they are inadequate to the great heat and foulness which begin when the gas-jets are lit. Thus, says Dr. Smith, "in " one room, with many large ventilators, in which 90 men " work, and 167 gaslights burn, the heat becomes almost " insufferable . . . . . The effect of introducing the ventilators " has, however, been to lessen the moisture of the air, so that " streams of fluid no longer run down the windows or fall " from the skylight, and the air has lost its murkiness, " even when all the gaslights are in operation . . . . It not " infrequently happens that fumes from a foundry, or foul " odours from machinery or sinks, rise from the lower room, " and aggravate the evils of the upper one. The heated air of " the lower rooms always tends to heat the upper by warming " the floor, and when the rooms are low, and the consumption " of gas great, this is a serious evil, and one only surpassed " in the case where the steam boilers are placed in the lower " room, and supply unwished-for heat to the whole house " . . . . . As a general expression, it may be stated that " universally the ventilation is defective, and quite insufficient " to remove the heat and the products of the combustion of " gas in the evening and during the night, and that in many " offices, and particularly in those made from dwelling-" houses, the condition is most deplorable. This is partly due " to the difficulties of the case, and partly to the determina-" tion of the compositor to prevent ventilation. At the same " time it must be added that both employer and employed " are fully alive to the magnitude of the evil, and wait for " science to devise plans whereby good ventilation may be " effected under diverse conditions, and in all cases without " causing a perceptible draught."

Dress-makers apparently do not, on the whole, suffer so much as printers, nor nearly so much as tailors, from the

Workplaces of Printers, Tailors, and Dressmakers.

crowding and ill-ventilation of workrooms ;—but the details which are given in Dr. Ord's report show that to a considerable extent (and of course chiefly in establishments of low grade in the industry) the atmosphere in which dress-makers work is, at least during the hours of artificial lighting, overheated, foul, and unwholesome. Thus for instance, in 34 dressmaking establishments (not of the class worked by middle men) Dr. Ord found that the average allowance of cubic feet to each worker was only in four cases more than 500, in four other cases from 400 to 500, in five others from 300 to 400, in five others from 250 to 300, in seven others from 200 to 250, in four others from 150 to 200, and in nine others only from 100 to 150. The largest of these allowances would but be scanty for continuous work, unless the space were thoroughly well ventilated; and, except with extraordinary ventilation, its atmosphere could not be tolerably wholesome during gaslight. The ventilation, however, says Dr. Ord, is as follows:—"In some of the large houses ventilation by " special apparatus is carefully attended to; but in the com- " moner workrooms ventilation is certainly disregarded, and " it is not uncommonly found that ventilators, even when " provided, are obstructed either wilfully or of neglect. For " instance, in one room, occupied by 25 persons, with 150 " cubic feet of space for each, and nine gas-jets burning, I " found that four ventilators were provided, two, namely, " opening into the chimney, and two in the windows. Three " of these were useless, one of the window ventilators having " a sheet of paper pasted over it, and the two chimney ven- " tilators being immovable. The air of the room was very " close and unwholesome; but I was informed that the girls " sitting near the windows could not bear the draught, and " had therefore stopped up the ventilator. Sitting for many " hours without exercise in warm rooms, the girls naturally " become extremely sensitive to currents of air, and, in con- " sequence, such obstructions of ventilators are not uncommon. " In a low confined room, containing upwards of 30 persons, " where ventilating tubes were placed over the gas burners " to carry off the products of combustion, I found three tubes " out of four purposely blocked up. Even with good ventila-

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" tion the workrooms tend to become very hot and close at " night on account of the number of gas-jets required for the " proper lighting up of the work. Where the cubical space " for each person is 200 or 250 feet, where a large gas light " is provided for every three or four persons, and where the " ready access of fresh air is not provided for, the atmosphere " becomes very unwholesome. Much illness and deterioration " of health among the workers may, in my opinion, be " referred to such conditions." And here is Dr. Ord's note concerning an establishment which he visited of the lower or middle-man's class ;—" One room, area in cubical feet, 1,280 ; " persons present, 14 ; area to each, in cubical feet, 91·5. The " women here were weary-looking and squalid ; their earn- " ings were stated to be 7*s.* to 15*s.* a week, and their tea. The " hand who earned only 7*s.* was young and inexperienced. " Hours 8 a.m. to 8 p.m. The small room into which these " 14 persons were crowded was ill ventilated. There were two " moveable windows and a fireplace, but the latter was blocked " up, and there was no special ventilation of any kind. This " house, in which comfort and health were alike ignored, dis- " played most painfully the evils to which the servants of poor " employers are subject."

But this is not all. Besides the sanitary faults of workplaces which the above extracts may illustrate, overwork prevails in all the three industries,—overwork which is systematic, not occasional,—overwork which, with rare exceptions, pervades each industry more or less as its rule,—overwork which, even if the workplace were well ventilated, would of itself suffice to breed disease.

Tailors, in those atrocious workshops which Dr. Smith describes, work generally for about 12 or 13 hours a day, and at some times the work will be continued for 15 or 16 hours. Printers on weekly averages of their labour would be found to spend fewer hours in the workroom ;—but their labour is, in very large proportion, night-work, which often is irregularly combined with day-work ;—and in some offices (especially those of weekly newspapers) there will be work—work too, in which boys between 12 and 16 years of age take equal part—for almost uninterrupted periods of two days and a night at a

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time;—while, in other printing offices, which lay themselves out for the doing of "urgent" business, Sunday gives no relaxation to the workman, and his working-days become seven instead of six in every week. The overwork of young women in fashionable dressmaking establishments does not, for more than about four months of the year, prevail in that monstrous degree which has on many occasions excited momentary public surprise and indignation; but for the in-door hands during these months it will, as a rule, be of full 14 hours a day, and will, when there is pressure, be, for days together, of 17 or even 18 hours. At other times of the year the work of the in-door hands ranges probably from 10 to 14 hours; and uniformly the hours for out-door hands are 12 or 13. For mantle-makers, collar-makers, shirt-makers, and various other classes of needle-workers (including persons who work at the sewing-machine) the hours spent in the common workroom are fewer—generally not more than 10 to 12 hours; but, says Dr. Ord, the regular hours of work are "subject to "considerable extension in certain houses at certain times, by "the practice of working extra hours for extra pay, and in "other houses by the practice of taking work away from "houses of business, to be done after hours at home; both "practices being, it may be added, often compulsory."*

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* Mr. Radcliffe, of Guildford Street, the Honorary Secretary of the Epidemiological Society, has been kind enough to furnish me with some notes and observations of his own relating to milliners and dressmakers employed in first-class houses of business. Happening to have unusual opportunities for questioning the young women when away from business and from the influence of their employers, he has made in a limited number of instances most careful and minute inquiry into the real state of health of girls who called themselves "quite well," and who might be regarded as fairly representative of their class. The result was that in only one out of twenty girls examined could the state of health be pronounced good; the rest exhibiting in various degrees evidences of depressed physical power, nervous exhaustion, and numerous functional disorders thereupon dependent. He attributes these conditions in the first place to the length of the hours of work—the minimum of which he estimates at 12 hours a day out of the season; and secondarily to less universally existing causes,—such as crowding and bad ventilation of workrooms, gas-vapours, insufficiency or bad quality of food, and inattention to domestic comfort. He insists very much on the ill effects of neglect of domestic comfort,—as in bad cooking of food, monotony of diet, careless or dirty serving of food, scant furnishing of bed-rooms, insufficient supply of water, and of accommodation for personal cleanliness, want of arrangements for useful employment of leisure, &c. For remedies,

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While deeming it my duty to bring prominently forward for consideration these facts which the recent inquiry has made known to their Lordships with regard to the overwork of certain large classes of operatives, I do not in any degree contend, that, in our present social circumstances, the overwork of adult men is a matter for legislative interference. I am aware that, in the judgment of present society, such interference would be beyond the proper province of law,—would be dealing with evils which in the long run will best right themselves without legislature. But that younger persons ought to be protected against extortionate and merciless taskmasters or parents,—that even adult women, at least when collectively employed, ought also to be fenced round with such imperfect protection as law can give them against overwork,—has in principle been affirmed by the legislature. And it may be that, in accordance with the precedents thus already established, some of the cases which I have now brought forward will be deemed fit to be dealt with by law.

But even more than for the overwork itself, it is for the attendant circumstances of the labour, that now, as in former reports, I would venture to claim particular attention.

Mortality from industrial diseases.

In my Fourth Annual Report I showed how practically impossible it is for workpeople to insist upon that which in theory is their first sanitary right,—the right that whatever work their employer assembles them to do, shall, so far as depends upon him, be, at his cost, divested of all needlessly

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apart from legislative interference, he looks chiefly to publicity; the good effects of which he finds illustrated in the improvements which followed the publication of Mr. Grainger's report. But he points out that the more advanced of the workers, those who in time will become employers, are so accustomed to the existing system, that even if they be not indifferent to its evils, there is little probability that they would, when they possess the power, modify the system to the extent required. And for this, which he holds to be a chief obstacle to thorough measures of amelioration, he believes that a higher grade of education would be the remedy. He would wish to see provided for young women engaged in trade the same facilities for education as are now provided so freely in the metropolis for young men; and he is of opinion that the excellent "Homes" now existing in London might be the best machinery for bringing that remedy into application.—J.S.

Mortality from industrial diseases.

unwholesome circumstances; and I pointed out that, while workpeople are practically unable to exact that sanitary justice for themselves, they also (notwithstanding the presumed intentions of the law) cannot expect any effectual assistance from the appointed administrators of the Nuisances Removal Acts. In the two years which have elapsed since the making of that fourth report, my information on the industries of England has necessarily been increased and extended. And now, with this bettered information, I beg leave to express my opinion that the whole large question of the sanitary circumstances of labour demands very urgently the consideration of the legislature.

So far as printers, tailors, and dressmakers are concerned, the appendices of my present report contain evidence which will, I think, be deemed sufficient to justify the opinion which I express. And lest the urgency of their case should be undervalued, I here insert a table (for the figures in which I am indebted to the Registrar General) showing the exces-

Number of Persons of all ages employed in the industries respectively.	Industries to be compared as to their effects on health.	Death-rates per 100,000 men employed in the respective industries at the undermentioned ages.		
		25–35.	35–45.	45–55.
958,265	Agriculture throughout England and Wales	743	805	1,145
22,301 men 12,377 women	London tailors	958	1,262	2,093
13,803	London printers	894	1,747	2,367

N.B.—It is probable that at the age of 25–35 the mortality of tailors and printers in London is greater than that represented in the first of the above columns of figures. For in both industries, London employers receive from the country large numbers of youths and young adults (probably up to 30 years of age) as apprentices and "improvers." These young men are of course counted in the census as London tailors and London printers respectively. But while their presence thus swells the *number of hands* on which the London industrial death-rates have to be reckoned, it probably does not contribute in anything like the same proportion to the *number of deaths* in London. For the stay of those young men in London is, under any circumstances, only meant to be temporary; and if, during this time, they are attacked in London by serious chronic disease (such as phthisis) they probably return to their country homes, where, if they die, their deaths would be registered.

This influence affects still more the earlier ages, and renders the London death-rates for those ages quite valueless as measures of the industrial insalubrity. For instance, the death-rate of London tailors at the age 20–25 is represented to be less than that of the agricultural population of the same age, the former being only 715, while the latter is 762. But the fallacy of this representation is seen as soon as we look at the death-rate of tailors at the same age in England and Wales generally, which is 1,113. Similarly, the death-rate of printers generally at the age of 20–25 is 949, while the fallacious death-rate of the London printers at that age is only 698.

Mortality from industrial diseases.

sive mortality of London printers and London tailors as compared with the healthy standard of agricultural industry. I have no such statistics with regard to dressmakers; nor can I, as regards any special industry, give death-rates calculated (like the district death-rates in the last preceding table) for the one particular fatality of lung-disease. But Dr. Smith's report tells, both for printers and for tailors, that phthisis and other lung-diseases are notoriously in vast excess. He finds reason to believe that, among the printers of London, phthisis, in proportion to other diseases, is twice as prevalent as even among the general male population of London. He finds also that among tailors "consumption and other forms "of chest disease constitute two-thirds of all the causes of "death." And the annexed table shows the effect of those diseases in swelling the general death-rate of each occupation. It will be seen that, at the age of 35–45, the mortality of London tailors is 57 per cent. higher, and the mortality of London printers more than 117 per cent. higher, than that of the male agricultural population. It also shows that, at the age of 45–55, the London tailors have nearly twice, and the London printers more than twice, the mortality of the agriculturists.

In support of the same opinion with regard to other industries, I would refer to the detailed evidence given in my third, fourth, and fifth reports, and to the overwhelming statistical evidence which has recently been laid before Parliament. Especially I would advert again to the statistics which I have already quoted, with regard to the prevalence of pulmonary disease at our principal seats of textile industry, and in our straw-plaiting, glove-making, hosiery, and lace-making districts. And in further illustration of the case I would submit the annexed table, showing to how deplorable an extent various other industries tend to destroy their workpeople by chronic lung-disease (here usually not phthisical, but irritative and inflammatory) which breaks them down in what should be their prime of life. By this table, namely, the fact is shown that, in the districts where miners and metal-forgers and cutlers and potters follow their respective industries, the death-rate, by lung-disease, of men aged from 45 to 65 is

Mortality from industrial diseases.

from 2½ to 8 times as high as in healthy agricultural districts.

	Deaths per 100,000 by phthisis and other diseases of the lungs.		Mean of the Two Columns, reduced, for Facility of Comparison, to the Scale of the Standard group, taken as 100.
——	Men aged 45–55.	Men aged 55–65.	
Redruth	1,499	2,360	482⅜
Penzance	975	1,157	266½
Wolstanton	1,173	1,811	373
Stoke-on-Trent	1,309	1,787	387
Wolverhampton	763	1,430	274
Birmingham	1,169	1,907	384½
Aston	697	1,290	248⅜
Sheffield	1,205	1,912	389⅝
Reeth	1,391	3,214	575⅝
Alston	2,069	4,400	808⅝
Abergavenny	628	1,305	241⅝
Merthyr Tydfil	898	1,582	310
Standard Northern Districts	322	477	100

These arguments, taken together, will, I trust, establish my position. Doubtless there may be some small technical difficulty in defining the exact line at which employers shall become subject to regulation. But I would submit that, in principle, the sanitary claim is universal. And in the interests of myriads of labouring men and women, whose lives are now needlessly afflicted and shortened by the infinite physical suffering which their mere employment engenders, I would venture to express my hope, that universally the sanitary circumstances of labour may, at least so far, be brought within appropriate provisions of law, as that the effective ventilation of all in-door workplaces may be ensured, and that in every naturally insalubrious occupation the specific health-endangering influence may as far as practicable be reduced.

Residence in Marsh-districts.

3. *Residence in Marsh-districts.*

(i.) *As regards Ague and other Malarious Diseases.*

Ague, &c.

Till a comparatively late period in the history of this country, there were vast tracts of marsh-land which could not, without much detriment to health, be inhabited. Of course in England marsh-malaria never obtained that desperate malignity which it has in tropical climates. Nor probably was it ever even nearly so fatal as in the southern parts

Ague, &c.

of Europe; where, through its operation, fevers of perilous kinds and very severe dysentry are habitual and general dangers to life; and where even yellow fever, if its infection be introduced, finds a congenial soil for its development. But, though of less formidable intensity here than in those hotter climates, marsh-malaria was a great morbific influence in England. Even in London, till that better draining and paving which after the great fire attended the re-construction of the City, ague used to be among the most prevalent and most fatal of diseases; and now not a century has passed, since it still used to have considerable prevalence in London.* At present, in London proper, it is unknown as an endemic disease. In other parts of England, its cessation has been far slower and less complete. True, that by the Registrar-General's reports it appears as causing in all England only from 140 to 240 deaths per annum. But, if one may judge by the records of the Peterborough hospital, where out of nearly 4,000 malarious cases, treated during the last 14 years, only one has proved fatal,—even 140 to 240 annual deaths would represent a very extensive (though not severe) prevalence of the disease. And, moreover, almost certainly those registered deaths from ague are not nearly all the

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* With regard to agues, says Sir Gilbert Blane, in his dissertation on the comparative prevalence and mortality of different diseases in London, "we learn "from Dr. Caius or Keye, the most eminent physician in England of that age, "that the mortality from agues in London in the year 1558 was such, that the "living could hardly bury the dead. And Bishop Burnet, in his history of the "Reformation, speaking of the same year, says, 'intermitting fevers were so "'universal and contagious, that they raged like a plague.' In the next century, "we learn from Sydenham and Morton, that intermittent fever was one of the "most prevalent and fatal disorders in London from 1631 to 1665, and that for "some years afterwards this complaint was very rare. This was probably "owing to the great dryness of the streets, effected by draining, when the city "was rebuilt after the great fire of 1666. We are told, however, by Sydenham, "that these fevers revived before the end of the century, and were epidemic "from 1677 to 1685. They prevailed a good deal during the first part of the "eighteenth century. The number of deaths reported in the bills in 1728 is "44; in 1729, 47; in 1730, 16; they then greatly declined; but, we learn from "a work of Dr. Fothergill, that they returned in an endemic form in the years "1751, 1753, and 1754. For more than 30 years past from the date of writing "this [1813] according to my own observation, and the best information I can "gather from others, this disease has not been known as an endemic in this "metropolis."—J.S.

Ague, &c.

deaths which marsh-disease has occasioned;—for when marsh-malaria destroys life in this climate, almost always it is by secondary, not by primary effects; and the deaths which thus occur are apt to be registered, not as ague-deaths, but as deaths from dropsy, or from liver-disease, or from other abdominal affection.

In 1863 the Lords of the Council thought it desirable to inquire to what extent marsh-disease now ordinarily prevails in the districts which have had the reputation of breeding it. And for the purpose of this inquiry, I under their Lordships' directions instructed Dr. Whitley to visit the principal marsh-districts of England, and to investigate their sanitary state.

The report [A] made by Dr. Whitley is in the main very satisfactory. It records, as regards England generally, that "the diseases which have been made the subject of " the present inquiry have been steadily decreasing both in " frequency and severity for several years, and this decrease is " attributed in very nearly every case mainly to one cause, " improved land drainage." Partial exceptions are here and there to be found to this rule of general improvement " Districts where apparently there has not been in late times " much or any lessening of malarious influences, and where " consequently all, or nearly all, the improvement has yet to " be made, are Huntspill and the marshes on the banks of the " river Swale." And, as might be expected from the nature of the case, instances are more numerous where, though improvement has been made, room, even much room, still remains for improvement. Such particularly are the districts of Sheppey, Hoo, Spalding, Hull, New Romney, and Lewes.

Having regard to the serious evil which malaria is in any district, and especially to the harm which in such districts it inflicts on the poorer parts of the agricultural population, I hope that its complete extinction from among us may not be unnecessarily delayed, but that in both classes of districts to which I have referred, and of course peculiarly in the first-mentioned one, the landowners and local authorities will speedily give the furthest proper extension and the fullest possible effect to that system of thorough land-drainage which has already done so much for improving the health of the country.

(ii.) *As regards the Mortality of Infants.*

Infantine mortality.

After the completion of the above-described general inquiry into the sanitary state of the marsh-districts of England, a partial further inquiry was necessary with regard to the very curious fact (now first made known to their Lordships) that, in some entirely rural marsh-districts, the habitual mortality of young children is almost as great as in the most infanticidal of our factory-towns;—that Wisbeach, for instance, is within a fraction as bad as Manchester;—and that, generally, in the registration districts of Wayland, Thorne, Mutford, Guiltcross, Walsingham, Goole, Spalding, Ely, Docking, Howden, King's Lynn, North Witchford, Yarmouth, Downham, Holbeach, Norwich, Whittlesey, and Hoo, as well as in Wisbeach, the death-rate of infants under one year of age is from 2¼ to nearly 3 times as high as in the sixteen districts of England which have the lowest infantile mortality.

Under their Lordships' orders, I instructed Dr. Hunter to inquire into the meaning of this unexpected fact. And now, before adverting to the explanations which he has found for it, and which his report fully sets forth, it will be convenient to refer more precisely than I have yet done to the great differences which there are of infantine death-rate in different parts of England, and to the explanations hitherto found for them.

There are in England 16 registration districts, which have, as their mean annual death-rate for infants under one year of age, but 9,085 deaths per 100,000 living; and in one of these districts the death-rate is as low as 7,047. There are 24 districts where the death-rate, though over 10,000, is under 11,000,—39 where, though over 11,000, it is under 12,000,—and 48 where, though over 12,000, it is under 13,000. On the other hand, in 22 districts * it exceeds 20,000. In 25

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* Westminster, Holborn, St. George, Ampthill, Leighton Buzzard, Luton, Ipswich, Wayland, Docking, Plymouth, Bristol, Stourbridge, Alcester, Barrow-on-Soar, Basford, Halifax, Dewsbury, Thorne, York, Sculcoates, Sunderland, Abergavenny.—J.S.

Infantine mortality.

more districts * it exceeds 21,000. In 17 more districts † it exceeds 22,000. In 11 more districts ‡ it exceeds 23,000. Further, in Hoo, Wolverhampton, Ashton-under-Lyne and Preston it exceeds 24,000, and in Nottingham, Stockport and Bradford, exceeds 25,000; while in Wisbeach and Manchester respectively the death-rates are 26,001 and 26,125.

In my report of 1858 I had stated my belief that the wide differences of infantine death-rate which are to be found in different districts of England (differences which at that time could be but very imperfectly measured) are "due to the "varying prevalence of two local causes:—

"first, to *differences of degree in common sanitary defects* of residence; some places abounding more than others in the foul air and foul water of undrained, unpaved, unscavenged, unwashed, unlighted, unventilated, localities and houses;

"and secondly, to *occupational differences* among the inhabitants; there being certain large towns where women are greatly engaged in branches of industry away from home; where, consequently, the home is ill kept; where the children are little looked after; and where infants who should be at the breast are improperly fed or starved, or have their cries of hunger and distress quieted by those various fatal opiates which are in such request at the centres of our manufacturing industry."

In 1861 an inquiry was made into the second (hitherto the less investigated) of those two causes. It resulted in showing the very extensive and powerful operation of that influence in several of our greatest centres of manufacture. It showed, moreover, that while, with the described circumstances, infants perish under the neglect and mismanagement which their mothers' occupation implies, the mothers become to a grievous

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* Whitechapel, St. Saviour, St. Olave, Towcester, Northampton, Mutford, Guiltcross, Walsingham, Birmingham, Blaby, Hinckley, Loughborough, Spalding, Hayfield, Wigan, Leigh, Bury, Chorlton, Burnley, Keighley, Hunslet, Barnsley, Goole, Hull, Newcastle.—J.S.

† St. Giles, Biggleswade, Ely, North Witchford, Yarmouth, King's Lynn, Stoke-upon-Trent, Walsale, Dudley, Nuneaton, Macclesfield, Salford, Blackburn, Sheffield, Howden, Merthyr Tydfil, Crickhowell.—J.S.

‡ Whittlesey, Norwich, Downham, Wolstanton, Foleshill, Leicester, Holbeach, Radford, Bolton, Oldham, Leeds.—J.S.

Infantine mortality.

extent denaturalized towards their offspring—commonly not troubling themselves much at the death, and even sometimes (it was believed) taking direct measures to ensure it. Now, as regards both classes of infanticidal influences to which I have referred, it had seemed that the great centres of the life-destruction must be in towns;—that in towns (or at least amid relatively dense gatherings of population) there would more commonly be found in excess, not only the filth which makes residence unwholesome, but also the collective employments which withdraw mothers from their home. The discovery that an enormous infantine mortality was prevailing in several purely agricultural districts suggested, at first sight, that perhaps in these districts some third sort of destructive influence was at work. And for the solution of this doubt Dr. Hunter's inquiry was ordered.

The result of this new inquiry, however, has been to show that the monstrous infantine death-rate of the examined agricultural districts depends only on the fact that there has been introduced into those districts the influence which has already been recognized as enormously fatal to the infants of manufacturing populations—the influence of the *employment of adult women.* "The opinions (says Dr. Hunter) of about 70 " medical practitioners, with those of other gentlemen ac- " quainted with the condition of the poor, were obtained. " With wonderful accord the cause of the mortality was " traced by nearly all these well-qualified witnesses to the " bringing of the land under tillage, that is, to the cause " which has banished malaria, and has substituted a fertile " though unsightly garden for the winter marshes and " summer pastures of 50 or 100 years ago. It was generally " thought that the infants no longer received any injury " from soil, climate, or malarious influences, but that a more " fatal enemy had been introduced by the employment of the " mothers in the field." On this agricultural employment of women there follow identically the same results as have already been traced to result from the employment of women in manufacture. The mother, as soon as she can rise from her confinement, goes again to work, leaving, while she is away, her infant to anyone who will pretend to take care of it.

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Instead of its natural food, entirely improper stuff is given it. "Cow's milk is dear, and often quite unattainable by these "people, and sugar sop, a lumpy mass of bread, water, and "sugar, is given instead. This is either given cold, or is left "on the fire-hob in a cup, seldom or never changed or cleaned, "whence the fermented and sooty mass is heaped into the infant's mouth by the nurse, who prefers this mess to cow's milk, "under the notion that 'the two milks could never agree.'" But this is not the worst. "So-and-so has another baby;— "you'll see it won't live," is the neighbourly view which Dr. Hunter finds to be taken of the predictability of certain events among these demoralized populations. And the predicted event soon comes,—perhaps through the normal operation of the diet which Dr. Hunter describes,—perhaps through the almost incredible cruelty of deliberate starvation,—perhaps through an intentional or unintentional over-dose of the opium which is universally employed.* "A medical man is called to the "wasting infant, 'because there is so much bother with regis- "'tering.' The mother says the child is dying, and won't "touch food. When *he* offers food, the child is ravenous, and "'fit to tear the spoon to pieces.' On some of the few oc- "casions on which the surgeon in his disgust has insisted on "opening the body, the stomach and bowels have been found "quite empty. It was in many places reported that infant "life had been saved in the midst of one of these wastings "by the threats of a determined surgeon or neighbour. "Where the coroners have been induced to support these "attempts to save life; where inquiry has been made, and "severe admonition, with an appearance of a chance of com- "mittal; also, where the registrar has pretended to refuse "registration without medical certificate in families notorious "for their loss of infants,—in these cases an amendment has "taken place. It was more than once related, that women "who had lost two or three successive children lost no more "after it had been plainly signified to them that their pro- "ceedings were watched. Bad as is the starvation of infants, "another practice is more common and more lethal; this is

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* Respecting the enormous general consumption of opium in these districts something will be said in another section of this report.—J.S.

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" the drugging with opium. . . Cases of death from opium " poisoning are supposed to be common; occasionally they " are the subject of inquests; sometimes they are recorded as " cases of 'overlying;' but the medical practitioners are of " opinion that by far the most common end of such cases is the " simple registration and burial as cases of '*Debility from* " *birth, no medical attendant,*' '*Premature birth,*' and such " like;—the public opinion of the neighbours seldom going " beyond a sneer or sarcasm on the occurrence of a quarrel " months or years after. So perfectly did the main body of " medical practitioners agree in the opinion that 'ablactation " 'and narcotism' would be the true description of the cause " of death of more than half the infants recorded, that a list " of their names seems to be all that is necessary to be added." And Dr. Hunter adds the list of the 67 medical witnesses from whom the information was derived.

Even as compared with factory-labour, the female agricultural labour of the marsh-districts shows some very bad features. It is (as Dr. Hunter describes) often migratory,—the women often travelling in "gangs" under charge of an "undertaker," who contracts for them; and, under this system, neglect of infants must of course be as great as possible. The system, moreover, conduces to a vast quantity of reckless fornication. The proportion of illegitimate births is extraordinarily great. And perhaps the darkest shades of Dr. Hunter's picture are for cases where the infant's burthensomeness to its mother is increased by this complication of illegitimacy. The illegitimate births, he says, "frequently " occur in the workhouse, and here, until the child is taken " out, it thrives as well as others, but within a few weeks " after their discharge the mother will go to the registrar, to " inform him that her child is dead, and that it was always " weakly, and never 'likely for life.' The lawful child fares " little better when the mother belongs to a gang, or even " does ordinary field work in her own parish. In the agri- " cultural population it may be roundly stated that of the " illegitimates one third die under a year old, of the others " one fourth part. Then it must be remembered that in the " latter class, who form nine tenths of the births, are found

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" nearly all those of people whose comfortable circumstances " allow them to give proper time to nursing their children."

In concluding this very sad recountal of evils, for which I cannot suggest any effectual remedy, I will observe that my knowledge of such evils may excuse the profound misgiving with which I regard any large industrial employment of adult women.

4. *Hospital Hygiene, especially in relation to the so-called traumatic infections, and to the spread of contagious fevers.*

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Early in 1863, pursuant to the programme of sanitary investigation which I had sketched in my report of 1858, I submitted to the Lords of the Council that among the subjects which were now next claiming to be investigated was that of the influence of sanitary conditions on the curative efficiency of hospitals.

Besides the general reasons, suggested in 1858, for the making of such an inquiry, there had recently arisen a very striking illustration how much the inquiry was needed. The displacement of St. Thomas's Hospital from the site which it had for six centuries occupied at the south end of London Bridge gave rise very properly to much public discussion as to the rules by which the governors of that important charity ought to be guided in their choice of a new site for the hospital. And in the course of this discussion it became evident that the opinions expressed with regard to the relative importance of different sanitary circumstances in determining the salubrity of hospitals, were not directly deduced from a comparison of hospital experiences, but were inferences (right or wrong) from cases of supposed analogy, and that not on either side were there means for comparing in any useful way the success of one hospital with the success of another.* It was indeed scarcely to be hoped that the results

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* I personally felt that, if the governors of the hospital had appealed to the Privy Council for information in the matter, I could not have submitted to their Lordships any credible existing documents on these subjects. And when it devolved upon me, as one of the surgeons of St. Thomas's, to take part with my colleagues in advising the governors whether town or country should be preferred

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of any inquiry which their Lordships might order could be of public use with regard to the apparently almost settled question of the site of St. Thomas's Hospital. But whether the collectable evidence could or could not be made to assist public judgment in that particular question, the need for the inquiry in relation to future like questions which might arise was too evident to be resisted. And moved by these considerations, my Lords, at the beginning of the financial year, ordered that during the remaining nine months of 1863 there should be made, on as large a scale as the time would permit, a medical and surgical inquiry into the sanitary circumstances and results of British hospital practice.

The two gentlemen whom, under their Lordships' orders, I instructed to make the inquiry, were Dr. Bristowe, Physician to St. Thomas's Hospital (who had already made various sanitary inquiries for the department) and Mr. Holmes, Surgeon to the hospital for Sick Children, and assistant surgeon to St. George's Hospital. To these gentlemen the object of the inquiry was proposed in the following terms:—
" *to ascertain the influence of different sanitary circumstances*
" *in determining in different hospitals (as compared with one*
" *another, and where practicable with private practice) more*
" *or less successful results for medical and surgical treat-*
" *ment;—particularly among patients who are submitted to*
" *surgical operations, or have undergone accidental injuries,*

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for the new hospital-site, I could not import into our consultation any arguments but from analogy. The terms in which the physicians and surgeons (including myself) finally advised, were, as regards the said point, these :—" Supposing
" two otherwise thoroughly well conditioned hospitals—one in London, the other
" in the country,—some of us believe, while others of us do not believe, that,
" in the results of medical and surgical treatment, the country hospital would
" have an appreciable superiority of success. If, however, we in this respect
" for argument's sake adopted, as though it were unanimous, the most sanguine
" belief which any one of our number entertains, our practical conclusion [that
" St. Thomas's Hospital ought not to be moved into the country] would be
" unchanged :—for unanimously we should be of opinion, that the advantages of
" the country hospital would be purchased at far too dear a price, when, in
" obtaining them, the hospital must be made inaccessible to the sufferers who
" most urgently require it, and when the present system of professional attend-
" ance must be changed in essential particulars." To this expression of opinion were added some suggestions as to special arrangements which are suitable for convalescents and chronic invalids.—J.S.

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“ *and among patients suffering from infectious fevers* “ *and other kinds of acute disease, and among puerperal* “ *women;—and with particular reference to the different* “ *degrees in which recovery is delayed or prevented by* “ *accidental morbid complications.*”

For attainment of the object thus proposed to them, Dr. Bristowe and Mr. Holmes, or one of them acting for both visited in succession almost every considerable civil hospital in England and Scotland, and all the more important hospitals of Ireland. Receiving always kind co-operation and welcome from the authorities and officers of the hospitals which they visited, they endeavoured in each separate case to gather the fullest information which minute local inquiry and observation could elicit,—first, as to all sanitary circumstances of the hospital sick,—and secondly, as to the practical effect of the circumstances. Further, when these inspections were drawing to an end, the inquirers represented to me that the correctness of some of the conclusions to which they were tending could not well be tested, except by adverting to the experience of a hospital system differing very considerably from our own, and that, for the purpose of thus checking the results and increasing the trustworthiness of their report on British hospitals, they would wish to be authorized to collect some evidence with regard to the hospitals of Paris. My Lords having sanctioned this proposed supplemental inquiry, an inspection was made of the chief Parisian hospitals and of their records; and the very short time which could alone be afforded for its prosecution was rendered in effect sufficient, by official help, which I am bound gratefully to acknowledge, from M. Husson, the distinguished director of the department of public assistance in Paris, and from Messrs. Blondel and Ser, two of the sanitary officers of that department.

In submitting the report [A] which Dr. Bristowe and Mr. Holmes have made on the subject of their inquiry, I may permit myself to say, that in my opinion it gives a singularly comprehensive picture, and (so far as circumstances permit) a substantially just relative appreciation of the present hospital system of this country. It is true that, from causes entirely beyond the reporters’ control, the report

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must be regarded rather as introductory than as final in its subject; for data could not be found for completely answering the pathological question which was proposed. In the vast majority of hospitals no scientific records were kept; and in the rare instances where reasonably good records were seen, these, as kept at different hospitals, where commonly so unlike one another, that no exact or minute comparison between them could be made. But though on this account the present report cannot be deemed exhaustive of its subject, and though especially there must remain for future inquiries many of the more subtle questions which the pathologist is anxious to see solved, yet, for practical purposes, the information now submitted will, I believe, importantly assist public judgment as to all broad rules of hospital hygiene.

In introduction to the report, I purpose here to say something as to the nature of the difficulties with which hospital managers have to contend, and as to the materials from which judgment may be formed concerning the skill with which that contest is conducted. From the nature of the case, my discussion of these subjects must be of an entirely technical character. In proceeding to it, I have to premise that, e cept where otherwise expressed, I speak only of general hospitals, and only of their in-patient practice.

I begin by interposing a caution—which is not, though perhaps it ought to be, superfluous, against one particular ambiguity of words in the discussion. What is the sense in which the word "healthy" may properly be applied to a hospital? In order that a hospital shall deserve to be called "healthy," we evidently do not require that its inmates shall be persons in health; for, to an establishment thus tenanted, the name "hospital" does not belong. Nor (it follows) do we require that the inmates of a hospital, as compared with corresponding numbers of healthy outside population, shall not suffer a high—even a very high—death-rate; for, since the hospital population is altogether a sick population, we expect that, in proportion to the gravity of the population's sickness, the hospital death-rate will exceed—perhaps, there-

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fore, will very greatly exceed, the death-rate which, for a corresponding healthy population, would be normal. A "healthy" hospital is a hospital which does not, *by any fault of its own*, aggravate ever so little the sickness, nor oppose ever so little the recovery, of persons who are properly its inmates. And this, the only right sense of the absolute word, governs of course the word's comparative applications; so that, when we compare together two hospitals with regard to their "healthiness," and call one of them the "unhealthier" hospital, our meaning is, that in this hospital, by reason of some fault of its own, disease cannot be treated as successfully as in the other hospital. And the "fault of its own" through which an "unhealthy" hospital fails to attain the best possible results for its medical and surgical treatment, is of one of two kinds:—either it is an *inherent fault*, as of site or construction; or else it is *fault of keeping*, as dirtiness, or overcrowding, or neglect of ventilation.

Evidently it is of the utmost consequence that hospital authorities, for their own administrative guidance, should be able to compare together the results which their respective hospitals attain. How then may this be done?

Of all the various forms in which medical or surgical unsuccess may become evident, DEATH is the most unquestionable; and if proper materials existed for the purpose, hospitals might well be compared with each other, in regard of their respective quantities of that particular sort of unsuccess. But in order that such comparisons may be something better than mere arithmetical idleness, it is essential that there be no error as to the principle on which the death-rates are to be estimated. Death-rates calculated on *given magnitudes of illness* are (as far as they go) true measures of medical or surgical unsuccess. But a definite "magnitude of illness" is not necessarily represented by any given number of *patients* taken indiscriminately. Magnitude of illness (as regards the number of deaths which are likely to result) may be almost infinitely greater in one set of patients than in another equally numerous set;—e.g., among a hundred inmates of the Fever Hospital, Islington, as compared with a hundred inmates of the Ophthalmic Hospital at Moorfields;—or among a hundred

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patients having advanced phthisis, or advanced Bright's disease, as compared with a hundred patients having hysteria, or ringworm, or chronic rheumatism. And unless due regard be had to this vastly uncertain import of the word "patient," death-rates, calculated on mere numbers of so-called patients, must be utterly worthless as measures of hospital unsuccess.

This consideration is of very great importance as regards any use to be made of the so-called "general death-rates" of general hospitals.* In the present state of knowledge it would be impossible that general death-rates should be calculated on exact estimates of the aggregate magnitude of illness treated in each hospital respectively. They may indeed be calculated on the other principle, calculated on the mere quantity, apart from the quality, of each particular hospital practice. But, when thus calculated, what pathological value can they have? For comparatively measuring hospital unsuccess, as against equal magnitudes of disease, they are utterly, even absurdly, inadmissible. Such could only be their meaning if it were first assumed that all the compared hospitals receive cases of equal (or not importantly unequal) gravity and dangerousness to life. But this assumption would be grossly inconsistent with facts. Hospitals, with regard to the quality of cases received in them for treatment, differ not triflingly, but enormously, from one another. Not only does it constantly happen that local circumstances tend to fill some hospitals rather than others with an excess of severe and dangerous cases, but different hospitals act on widely different principles as regards their reception of patients. While some charities recognise no other priority of claim to admission than that which consists in more severe and more urgent illness, while they evince noble pride and emulation in waging an ever precarious contest against the least conquerable forms of disease, and while they, thus competing with one another for the difficulties and dangers of

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* General death-rates are sometimes calculated on the *mean daily sick population* of a hospital; sometimes on the *aggregate number of cases treated*, during the year or other given time, *to a termination*. There are, I think, good reasons for preferring the latter mode. *See* note subjoined to the table at page 137.—J.S.

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practice, have the dying and even the dead brought in numbers to their receiving rooms,* and have their death-lists swollen by the many defeats which their more arduous practice involves,—defeats, however, against which there are corresponding victories and triumphs to be counted,—other hospitals pursue so different a course that their death-rates may well be low. Let the generous system which is followed at our chief urban hospitals, our great schools of medicine and surgery, or let the even better system which is followed at the hospitals of Paris, be compared with such a picture as that which the reporters draw of the system of our English rural hospitals:—"The functions which in Paris are exercised by "the hospitals in the treatment of acute disease are dis- "charged in the country districts of England by the medical "officers of the poor law unions, and of the clubs, and the "hospitals are reserved for the chronic cases. In many "country hospitals the beds are taken for some time before- "hand; in many the subscribers would not think they ob- "tained fair value for their subscription unless their nominee "was admitted, however little prospect there might be of his "receiving more benefit by treatment at the hospital than at "home; and not only admitted, but kept for the full 'term,' "as it is called, that is to say, the time during which a letter "is good.† The consequence is, and must be, that the "hospital is looked upon amongst the poor as a private "charity, as far as *disease* is concerned, and admission into it "is sought through private channels, just as into an alms- "house; in fact these country hospitals have become in great "measure sick clubs, in which the employer pays instead of "the patient. *Accidents* are known to be freely received,

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* E.g.—at St. Bartholomew's Hospital in 1863, 94 patients died within a day after admission, and 26 were brought dead to the hospital. The total deaths of the year were 557.—J.S.

† "This is usually either six weeks or two months. After that time the patient, if he is to stay, requires another letter. . . A curious illustration of the effect of the letter system upon the supply of patients is furnished by one of the hospitals which we have visited, where the hospital is moderately full while the governors have a good stock of letters, but becomes half empty at the season of the year when their stocks of letters are becoming low. This shows how little the practice of such hospitals corresponds to the real wants of the population."—J.S.

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" and are consequently always taken to the hospital; but we " believe we are right in saying that, at hospitals of the " purely 'country' class, urgent medical cases never present " themselves, except on the day of the weekly admission, and " then very rarely. Such a hospital, therefore, usually con- " tains a few grave accidents, and a still smaller number of " cases requiring surgical operation, amongst a much larger " number of chronic invalids, who have little more influence on " the sanitary condition, or on the atmosphere of the hospital, " than if they were in a condition of health: very few of the " patients are in any danger of speedy death, and of those who " are gradually sinking from visceral disease a great part prefer " to go home, when they find that they can expect no benefit " from treatment, or feel themselves near their death. Another " effect of this strict adherence to the letter system is that the " hospital is seldom, if ever, full; and that the daily average of " patients is very greatly below the number of beds.* .... It is " no exaggeration to say that a large proportion of those who " are under treatment in our country infirmaries might be " treated with as much success at home, while the victims of " acute disease are left to be attended in their own squalid " houses by the overworked officers of the club or the " parish."

These extreme differences of hospital-system must directly involve corresponding large differences of hospital-mortality. For easy and difficult tasks are not executed with equal quantities of success. But differences of death-rate thus occasioned are not facts of which the high-rated hospitals have any reason to be ashamed, or on which the low-rated hospitals can congratulate themselves.†

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* Out of 4,092 beds made up in the rural hospitals referred to in the report, only 2,813 were occupied at the time of the inspection.—J.S.

† Even with respect to two general hospitals, situated, as were Guy's and the old St. Thomas's, side by side in the same district, and having much similarity of constitution, no cautious reasoner would assume without certain knowledge that the two practices are of identical quality,—that a given large number of patients treated in the one hospital represents the same magnitude of illness as the same number of patients treated in the other hospital,—and that consequently any existing difference of death-rate between the two hospitals represents (in the proper sense of the words) a difference of hospital success. Indeed, as regards

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The utter inutility of general death-rates as measures of hospital healthiness may be illustrated by reference to some curious little tables which the Registrar General has published at page 205 of his 24th Annual Report. The late Census having shown how many special inmates were, on April 8th, 1861, contained in each of the hospitals of England, and the common mortuary returns of the year 1861 having shown how many deaths had in that year happened in each of the hospitals of England, the Registrar General reckoned from these materials a *general death-rate per hundred occupied beds* [which death-rate, in order to distinguish it from death-rates calculated on other principles, I will call the *bed death-rate*] for each of several hospitals and groups of hospitals in England. Those *bed* death-rates—as being calculated, not on mean daily sick population, but only on the accidental inmatage of a single day—cannot be more than approximative to true bed death-rates; and bed death-rates generally, by reason of the principle on which they are reckoned, are, in my opinion, for any hygienic argument, of all general death-rates the most fallacious*;—but both these objections to the Registrar General's bed death-rates are so trifling, when compared with the objections which I have stated in common against all general death-rates as measures of hospital healthiness, that I need not refrain from quoting the Registrar General's rates in illustration of my present argument. I accordingly annex a selection from them; partly to show how suspiciously great a range of death-rates there is among hospitals which are grouped as congeneric, and still more to show the very striking disparity of death-rates

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the two hospitals which I have particularly named, I have reason to know that, at least for some periods of time, such an argument would have been fallacious. And if the comparison would not be strictly unobjectionable even for that peculiar case, to what objections must it not be open when applied to hospital systems so different as those described in the text?—J.S.

* *See* note subjoined to the table. In both respects, their inconclusiveness may be illustrated by quoting the death-rates of a special hospital. Dr. Buchanan, one of the physicians of the London Fever Hospital, shows me that the bed death-rate of that hospital, calculated with reference to the number of special inmates who were in hospital on April 8th, 1861, was in 1860 nearly 300 per cent., in 1861 nearly 500 per cent., in 1862 nearly 2,000 per cent., and in 1863 nearly 1,400 per cent.—J.S.

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which there is between the groups when treated as wholes. Among the large-town hospitals, for instance, the Nottingham has a death-rate under 41, while the Manchester has a death-rate over 130; and among the minor hospitals, the Swansea has a death-rate of but 10, while the Bath has a death-rate of 102. But more importance might seem to attach to the comparison which is suggested in the first three lines of the table. It is within the mark to say that, according to those figures, the death-rate of the large general hospitals of large towns is twice as great as the death-rates of small hospitals in small towns; and partially informed persons reading this statement might easily imagine that the figures contain a most important hygienic lesson for hospital administrators. Nothing, however, could be farther from the truth. The figures—whatever other value

Classification of Hospitals, according to their respective Sites and Sizes.	Actual or Average Number of Special Inmates in each Hospital on April 8th, 1861.	Estimated Bed Death-rate for the Year 1861.
24 London Hospitals - -	176	90·84
12 Hospitals in large towns -	156	83·16
25 County and important provincial Hospitals - -	90	39·41
Hospitals in large Towns.		
Bristol Royal Infirmary -	224	56·25
Birmingham Queen's Hospital	135	58·52
Nottingham General Hospital	137	40·88
Liverpool Northern Hospital -	101	128·71
Manchester Royal Infirmary -	202	130·69
County and important Provincial Hospitals.		
Brighton, Sussex County Hospital - - - - -	109	66·06
Headington, Oxon, Radcliffe Infirmary - - - -	133	24·81
Dorchester County Hospital -	50	24·00
Devon and Exeter Hospital -	181	25·41
Bath United Hospital - -	78	102·56
Leicester Infirmary - -	83	61·45
Swansea Infirmary - -	80	10·00

N.B.—With reference to the *bed death-rates* given in the last column, it must be remembered that each bed receives during the year a succession of patients. A *bed death-rate* of 100 per cent. per annum means that in the course of the year there occurs on an average one death in every occupied bed of the hospital. The better principle on which to calculate general death-rates, for any little purpose which they can answer, is that of calculating them on the *aggregate number of cases treated* (during a year or any other given time) *to a termination.* This for distinction, may be called the *patient death-rate.* There is no necessary correspondence between such a range of *bed death-rates* as is shown above in the last column, and the range of *patient death-rates* for the same hospitals and groups of hospitals. Whether the two ranges would correspond or not, depends on whether the mean staying-time of patients is the same in all the hospitals and groups of hospitals compared. It is certain that this is not the case. The frequency of succession of patients (or, in other words, the mean staying-time of each) varies greatly in different hospitals; partly according to the size of the hospital in proportion to the number of applicants, partly according to the degree in which the hospital receives cases of acute disease. With knowledge of the mean stay of patients in hospitals, *bed death-rates* may at once be converted into *patient death-rates,* or vice versâ.

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they may have, are absolutely without intelligible relation to any question of hospital hygiene. For when read with such explanations as I have given (including these which are subjoined to the table) they are at once seen to be susceptible of widely different interpretations. They may be supposed, for instance, to justify any one of the three following conclusions:—(1) That the urban hospitals *change their sick population twice as often* as the rural hospitals, and that other conditions are equal; or (2) that in the urban hospitals *the mean gravity of cases received for treatment is twice as great* as in the rural hospitals, and that other conditions are equal; or (3) that in the urban hospitals the *success of treatment of given magnitudes of disease is half as great* as in the rural hospitals, and that other conditions are equal.* These conclusions (it is scarcely needful to say)

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* That the last stated of those three conclusions would be untrue, and that the ambiguous differences of general death-rate shown in the Registrar General's tables are in fact mainly dependent on such influences as are adverted to in the first and second conclusions, will assuredly not be questioned by any one who carefully considers the evidence which Dr. Bristowe and Mr. Holmes have collected. It is therefore in my opinion very much to be regretted that, in oversight of the real facts of the case, some readers should have interpreted the Registrar General's statistics in the sense which they least properly bear, should have insisted on their being viewed as inculpatory of our great urban hospitals, and should in quoting them have levelled against the most useful of our medical charities imputations which (to say the least of them) that evidence will not justify. For instance, in the last edition of Miss Nightingale's often admirable *Notes on Hospitals,* material from the Registrar General's report is quoted to show that the general death-rates of English Hospitals range as in the above table, and the inference is suggested that these different death-rates correspond to different degrees of "healthiness" and "unhealthiness" in the several kinds of hospitals respectively. And Dr. William Farr, adverting to this subject, in a letter recently written to the Medical Times and Gazette, and published in that journal on the 13th February last, gives the world to understand, as apparently his opinion, that general hospitals, by reason of "defects" which "render them "ways of death to their inmates," do not "benefit mankind directly," but "merely" as "pathological observatories and medical schools." It is fortunate that the subjoined report can relieve the medical profession and the public from the very painful but false impressions which Dr. Farr's language, while uncorrected, tends to create. The figures on which he relies show that during the year 1861, in proportion to the number of patients who were under treatment in the respective hospitals on the 8th April in that year, the hospitals in our largest towns had much more to do with dangerous forms of illness than the hospitals of country districts. But to conclude that the greater magnitude of illness in the town hospitals was a product of hospital-insalubrity, is as though one should conclude that the greater number of broken legs in a town hospital

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are not compatible with one another. But the special influences named in the first and second of them are in practice so likely to concur, that a fourth conclusion affirming the joint action of those two influences is perhaps more plausible than either the first or second, and may, for argument's sake, be taken instead of them. It will then be seen that this conclusion, like the two out of which it is compounded, is essentially opposed to the third conclusion. The one would affirm, while the other would deny, a true difference of hospital success. But to decide between those very two propositions is, in any argument concerning the hygiene of hospitals, the only object of the discussion. Evidently, then, those general death-rates cannot, except by petitio principii, be deemed at all applicable to the purpose. Nor can any such use be made of them till other information mediate in the matter, and convert them (should this ever be possible) into general death-rates proportionate to fixed magnitudes of disease.

It follows, I think, from the preceding observations, that, if hospitals are to be compared for any useful purpose, they must be compared in very considerable detail. The kind of question which has to be answered, with regard to any two compared hospitals or groups of hospitals, is this;—what are the average rates of death (or what are the average times spent in recovery) among *cases of like nature* treated in each hospital respectively? And when I say "cases of like "nature," I do not mean cases which popularly pass under

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had been broken by some hospital-agency. And to argue that hospitals are "unhealthy" in proportion to the number of deaths which occur in them, is as though one should argue that bedrooms are proved to be unhealthier than dining-rooms, because more people die in bed than at table. Infinitely nearer to truth in these matters were the opinions expressed fifty years ago by that very able sanitary writer, Sir Gilbert Blane, when (in his paper on the prevalence of different diseases in London—a paper which I have more than once quoted in the course of my present report) he observed, as follows:—"The comparative mortality of different hospitals is a most fallacious test "of the success of practice unless the nature and intensity of the several "diseases are taken into account. A large mortality may even be considered as "a presumption of an hospital being well conducted, in as far as it indicates that "the most severe disorders had been admitted, or, in other words, that the most "judicious selection of cases had been made." Med. Chi. Transact. 1813, p. 117. —J.S.

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like names, but cases scientifically grouped according to whatever important difference they have among themselves in regard of their chances of recovery. Thus, as regards surgical practice, a very important category of comparison would be that of "death-rates "after amputation;"—but the natural danger of an amputation varies according to several circumstances, — e.g., according to the magnitude of the amputated part, and according to the age of the patient, and according to whether the amputation be done for a chronic disease, or for an acute disease, or for the immediate effects of injury, or for the remote effects of injury, and according to whether the disease or injury affects other (especially internal) parts of the body;—so that the amputation-success of one hospital cannot properly be compared with the amputation-success of

ACCOUNT of terminated Cases in which Amputation was performed in . . . . . Hospitals during the Year . . . .

Patient.	Circumstances of Amputation.					The Operation.		Result of the Operation.					Explanatory Remarks on Circumstances which influenced the Result.	Notes by which, if desired, the Patient's Ward and Surgeon can be identified.
								If Death.		If Discharge.				
Sex, Age, and General Sanitary Antecedents.*	Nature of the Disease or Accident for which the Amputation was performed.	Date when the Disease began, or the Accident occurred.	Date of Patient's Admission to Hospital.	Date of Amputation.	Whether at the Time of Operation other Disease or Injury was existing, and if so, what.	Part Amputated.	Method of Amputation.	Date of Death.	Cause of Death.	Date of Discharge.	Whether Wound fully healed.	Whether Health fully restored.		

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* In order to save space I have used in my form the expression "general sanitary antecedents" to represent such headings as *occupation, residence, habits, ordinary health*. Perhaps these ought to have separate columns to themselves; for, under each of them, something might have to be noted which would mark the case ab initio as exceptional to the common run of cases.

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another hospital, unless the amputations be divided into classes corresponding to those different degrees of danger;—nor can a sufficient classification of cases be made unless all major amputations be registered with at least as much detail as I provide for in the preceding form.

A second very important category of surgical comparison would be that of "death-rates after lithotomy;"—but lithotomy (skilfully performed, where there is no recognizable disease of kidney nor advanced disease of bladder) has its death-rate so predominantly governed by the ages of the lithotomized patients, that, unless the patients be classified according to age, no useful comparison of lithotomy successes can be made.

Of course, with respect to either of the above kinds of comparisons, if two compared hospitals or groups of hospitals were quite similarly circumstanced, and if the comparison were on a sufficiently large scale, it might be assumed as probable that the *omnium* of major amputations in one hospital would contain about the same mixture of cases as the *omnium* of major amputations at another hospital, and similarly with the *omnium* of lithotomies. But extreme caution is requisite not to make this assumption improperly;—for, as regards both operations adverted to, the *scale of natural danger* due to such influences as I have named has a far larger range than the *scale of artificial danger* which it would be the comparer's object to discover; and with any careless assumption that unexamined circumstances are equal, very large fallacies may creep into well-meant comparisons. When, for instance, it is seen that, according to Mr. Teale's analysis of 679 cases of amputation of the thigh or leg, the death-rate of amputations for injury is twice as great as the death-rate of amputations for disease,—or when it is seen (as in the annexed table) that Cheselden's lithotomical unsuccess was about fifteen times as great among patients over 50 years of age as it was among patients under 10 years of age,—it will be obvious that, in any aggregate comparison of amputation-successes or lithotomy-successes, great apparent superiority on one side might be due to the fact that on that side a larger proportion of the amputations had been for

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disease, or a larger proportion of the lithotomies had been of children; and it will follow that, even where such aggregate comparisons are between hospitals quite similarly circumstanced, any *omnium* of cases which is meant to exclude even approximately such sources of fallacy as I have indicated must be of exceedingly large dimensions. So again, as regards physicians' practice, the "death-rates of fever-cases" would be entirely valueless for comparison unless the fever-cases were distinguished according to their respective kinds,—*typhoid, typhus, relapsing*, &c.; for, of the three best defined kinds of fever common in the united kingdom, two have a natural dangerousness seven or eight times as high as the third, and the fever-success of one hospital may have differed from the fever-success of another hospital only because the one hospital has happened to treat chiefly the more dangerous or the less dangerous kind of disease. Moreover the unsuccess of treatment against a given kind of fever is not expressed in a form for exact comparison unless the fever cases be classified according to age;—for the natural dangerousness of a fever to the person who has it varies greatly according to his age,—so that, for instance, a typhus patient aged 55 is at least ten times as likely to die as a typhus patient aged 15. Nor can unsuccess against a given kind of fever be spoken of in a comparative sense, without regard being had to the fact that the natural dangerousness of any given fever may be far greater in some epidemics than in others.

From Cheselden's Statement of the Result of 213 Lithotomies performed by him in St. Thomas's Hospital.

Age.	Cases classified according to Age.	Deaths.	Death-rate per Cent.
Under 10 years of age	105	3*	2·85
From 10 to 20 - -	62	4	6·45
From 20 to 50 - -	32	7	21·87
From 50 upwards -	14	6	42·85

* "One of the three that died out of the 105 was very ill "with a whooping-cough; another bled to death by an "artery into the bladder, it being very hot weather at "that time." *See* Cheselden's Anatomy, 12th Edition, 1784. pp. 332–3.

So much as regards the caution which must be exercised when the object is to use special death-rates as means of measuring hospital unsuccess in relation to particular kinds

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of disease. That caution having been duly exercised, such death-rates may be of the utmost interest and value; for, in their perfection, they are true measures of medical and surgical unsuccess, and may therefore be made instrumental, both to advance the professional science in some of its most important relations, and also to enlighten the public mind as to the respective merits of hospitals. But it must not be forgotten that, even when special death-rates exist in their trustworthiest form as material for comparing hospitals together, extreme caution is again requisite as to the conclusions which the comparison may justify. The immediate effect of the comparison is to demonstrate (say) for one hospital that it is comparatively unsuccessful in dealing with a certain set of cases,—that, in it, the natural dangerousness of lithotomy, or amputation, or fever, or what not, is aggravated by some abnormal influence. But hereupon the further inquiry ensues,—of what nature was the abnormally endangering influence which led to the demonstrated waste of life? The main possibilities of answer are three:—first, that the patients (from local circumstances, common to the population out of which they came) were of less than normal powers of life*;—or, secondly, that the treatment was inferior;—or, thirdly, that the hospital was unhealthy. Absolute decision between those alternative verdicts cannot in any case be made without further information than the mere special death-rate would afford; though of course persons practically familiar with the subject would often recognise a primâ facie probability against one verdict or another in regard of the particular speciality of unsuccess. Commonly each special death-rate will have to be broken up into such component parts as respectively represent the operation of different morbific causes, and thus serve to confirm or rebut particular inculpatory suspicions. But, beyond this, other special death-rates of the same hospital might have to be examined, and the special death-rates of the hospital might have to be compared with analogous death-rates of patients in

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* With this answer, of course, the responsibility of the hospital would be absolved. *See* foot note, p. 146.—J.S.

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the outside surrounding population, and the general sanitary state of that population might have to be taken into account.

Perhaps I cannot better illustrate the significance of these several questions than by referring to the part of the subjoined report which discusses the death-rate of major amputations, and particularly to the reporters' analysis of certain information which Mr. Teale published in 1858 with regard to 679 amputations of thigh and leg performed during the three preceding years in the various hospitals of England. The evidence shows (see annexed table) that the average death-rate per cent. of such amputations is higher in London hospitals than in country hospitals* in the proportion of 30 to 27¾. Primâ facie it is not probable that the treatment of such cases in London is inferior to the treatment of them in the country; and if provisionally that doubt be set aside, the apparent question to be solved is:—does

TABLE showing Mr. Teale's account of 679 amputations of thigh and leg performed in different hospitals in England.

——		Number of Cases.	Number of Deaths.	Percentage of Deaths.
I.—All the 679 amputations whether for disease or for accidental injury - -	1. In London hospitals -	314	103	30
	2. In hospitals of large provincial towns -	83	32	38½
	3. In country hospitals -	252	70	27¾
II.—The 217 amputations which were for accidental injury -	1. In London hospitals -	98	49	50
	2. In hospitals of large provincial towns -	36	19	52¾
	3. In country hospitals -	83	31	37⅓
III.—The 462 amputations which were for disease -	1. In London hospitals -	246	54	22
	2. In hospitals of large provincial towns -	47	13	27⅔
	3. In country hospitals -	169	39	23

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* The information collected by the reporters themselves with regard to 1837 major amputations (thigh, leg, foot, arm, and forearm) leads me to believe that the difference of success may be even considerably greater than Mr. Teale's figures represent:—that is to say, when those different amputations are taken together into calculation, it appears that, per 100 of them, the death-rate in the country hospitals is 19, in the hospitals of provincial towns 25½, in the hospitals of London 29¼,—or, in other words, that the special death-rate in the London hospitals is half as high again as in the country hospitals. Unfortunately the argument respecting these figures cannot be followed out, because the reporters were but very rarely able to learn the causes of such deaths as had occurred, and

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the higher death-rate in London express that the London hospitals are less healthy than the country hospitals, or does it express that the average Londoner is less able than the average rustic to bear up against severe surgical operation? Now, let Mr. Teale's figures be followed a stage further:—it appears (though unfortunately the numbers are not so large as to make the conclusion incontestable) that the higher death-rate of London amputations does not belong to all the amputations indifferently, but belongs exclusively to amputations done for injury,—that in these cases the London death-rate exceeds the rural death-rate in the proportion of 50 to 37⅓, but that in the other amputations the London death-rate is even a shade better than the country death-rate.

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were even unable to obtain such information as would have enabled them to divide the amputations into the two main classes of *amputations for disease* and *amputations for accident.* Therefore it is that in the text I refer to Mr. Teale's less extensive but far more complete information. Here, however, I insert a table, which, if it serves no other purpose, may at least in some respects conduce to check hasty generalisation on the present difficult subject. It is founded on the tables which appear in the report. It shows (inter alia) that, while the amputation death-rate in London hospitals *generally* was half as high again as in country hospitals, the high death-rate was not common to all the London hospitals,—that, on the contrary, nearly half of the London amputations (187 out of 410) were done with about the same death rate as the 502 rural amputations,—and that, so far as those small materials for comparison go, London hospitals do not nearly so much differ in the aggregate from country hospitals as they differ individually from one another.—J.S.

TABLE showing some of the statistical results obtained by Dr. Bristowe and Mr. Holmes with respect to amputations performed at different hospitals of United Kingdom.

Period to which the Statement relates.	Hospitals.	All major Amputations.		
		Cases.	Deaths.	Percentage of deaths.
3 years -	Bartholomew and St. George's -	165	32	19½
4 „ -	St. Thomas's -	138	43	31⅙
2 „ -	Guy's - - -			
1 „ -	London - - -	85	41	48¼
3 „ -	University - -			
2 „ -	Free - - -			
½ „ -	Middlesex - -			
1 „ -	Westminster - -	22	4	18⅕
3 „ -	St. Mary's - -			
*	Total of 10 London hospitals - -	410	120	29¼
From 1 year to 7 years.	34 rural hospitals -	502	95	19
From 1 year to 10 years.	20 hospitals of large provincial towns.	925	236	25½

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If the figures given in the table express even approximately the true state of the case, it would seem an open question whether vital differences between the Londoner and the rustic do not count for a good deal in determining the apparent differences of hospital success* ;—for differences of vital force would be likely to show themselves most in cases of such extreme vital shock as are primary amputations done on account of recent injury ;—and if the influence which determined the greatly higher death-rate of the 98 accident-amputations had been the influence of hospital unhealthiness, it is difficult to imagine why so powerful an influence should not have affected the death-rate of the 246 disease-amputations done in the same hospitals. Properly to discuss the question here suggested is quite impossible with existing data. For in such a discussion the elementary points for consideration would be these :—How many of the cases died under operation, or so soon afterwards that hospital unhealthiness (if it existed) could not have affected the result? How many died of complications, which quite unquestionably were accidental? How many died of diseases which hospital unhealthiness can produce? What, as regards these sub-specialities,

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* In relation to the particular figures which are under discussion, this question would have two parts: (1) Is the average Londoner less strong against vital shock than the average rustic? and (2) does the Londoner who comes for amputation on account of accident present on the average more bodily injury, especially as regards complication with internal damage, than the hurt rustic who goes for amputation? Strictly speaking, however, both of these questions ought to have been settled before the special death-rates are compared; for otherwise the comparison is not made with regard to equal difficulties of treatment. And for this purpose, as I have suggested at a former page, the record of amputations ought at least to enable any one who examines it to separate *complicated* from *uncomplicated* cases. Dr. Bristowe and Mr. Holmes are themselves of opinion, and speak of it as matter of general belief, that operation-cases treated in London are on the average cases of greater gravity than those treated in the country: there is, they "believe, very little doubt, that if we could take a "considerable number of the accident cases requiring operation admitted into "the wards of a hospital in a large manufacturing or seaport town, and compare "them with an equal number of accident cases requiring operation admitted into "a purely agricultural hospital, we should find the former comprised a much "larger proportion of complicated cases, of cases of 'smash,' than the latter; "in other words, the compound fractures arising from railways, from machinery, "from building operations, among shipping, and in dockyards, are more likely "to be associated with other grave injuries than those occurring in country "towns and among agricultural labourers."—J.S.

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are the death-rates of other hospitals, some similarly, some dissimilarly, circumstanced? And what are such death-rates for private practice, in the hospital district and in other districts? In order to speak with confidence on such points as these, it would be an absolute sine quâ non to possess fully elaborated exact returns relating to very large numbers of cases and especially to their causes of death.

It is very much to be regretted that no such returns exist. And adverting again to the point at which I took up this particular illustration of the mode in which special death-rates have to be discussed, I must express my very strong feeling that these are matters on which doubt ought not to be suffered to continue. For, whether a particular hospital or group of hospitals has a disproportionate quantity of unsuccess in its treatment of disease, is not a question of sterile statistical curiosity. The consideration that, where such unsuccess exists, two out of the three solutions which can be suggested for its existence are solutions which would criminate the hospital or group of hospitals to which they refer, is surely argument enough to show how very greatly it is the interest of properly conducted hospitals to cause full and truthful records of their respective experiences in such matters to be kept. And if it is the interest of such hospitals, also, I will venture to say, it is their duty, and the duty of all. Indeed I beg leave to extend this expression of opinion to the entire matter of hospital experience. The doings of hospitals and the relative successfulness of such doings, are of great public importance; and all questions concerning them ought to admit of being answered quite unambiguously to the public. For, while hospitals claim to be exempt from taxation on the ground that they render service for which otherwise the community must be taxed, the community may surely require to be satisfied by precise information as to the value of the service which is rendered. In none but the largest hospitals could the task of keeping such records be of anything like troublesome amount. And in these particular cases there exists an additional and special reason why even a really troublesome duty ought not on any account to be declined.

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Such hospitals are, always or generally, our great schools of professional study. And assuredly no hospital school of medicine and surgery is doing its full duty, unless it takes all possible means for recording the hospital experience in forms which shall test the efficiency of present practice, and ensure the promptest possible recognition of progress. No school of medicine deserves its name unless it be the scene of constant labour for improvement in professional science; and scientific medicine cannot be supposed to rest its belief on vague oral traditions of experience.

Let not, however, the preceding observations be misunderstood. My point is, that, during the present grievous imperfectness of hospital statistics, we cannot by such statistics accurately compare even in part (much less in entirety) the success of one hospital with the success of other hospitals, nor, à fortiori, the healthiness of one hospital with the healthiness of others. And I deem this to be a public wrong, and a bar to scientific progress. But meanwhile, happily for mankind, hospital unhealthiness is not a something about which no judgment can be formed, or which must needs wait unamended till by elaborate comparative statistics we have its exact mathematical measure before us. Sanitary defects, where they exist in hospitals, are appreciable by the skilled daily observers of the sick,—appreciable, in individual cases and according to common hygienic laws, as causes of disease or interruptions of recovery. I propose therefore to bring under consideration the elements from which these appreciations may be made, and, in order to do so, must first advert to the sanitary difficulties with which hospital managers have to contend.

The rules of hospital hygiene are, in principle, simple enough. That which makes the healthiest house makes likewise the healthiest hospital,—the same fastidious and universal cleanliness, the same never-ceasing vigilance against the thousand forms in which dirt may disguise itself, in air and soil and water, in walls and floors and ceilings, in dress and bedding and furniture, in pots and pans and pails, in

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sinks and drains and dustbins.* It is but the same principle of management, but with immeasurably greater vigilance and skill:—for the establishment which has to be kept in such exquisite perfection of cleanliness is an establishment which never rests from fouling itself; nor are there any products of its foulness—not even the least odorous of such products, which ought not to be regarded as poisons. Above all, this applies to the fouling of the air within hospital wards by exhalations from the persons of the sick. In such exhalations are embodied the most terrible powers of disease,—the spreading flames, as it were, of some infections, and the explosive fuel of others; and any air in which they are let accumulate soon becomes a very atmosphere of death. Against this danger ventilation is the one possible safeguard,—ventilation which with continuous current shall always be bearing away, as rapidly as evolved, every volatile taint which rises from the sick. So that, for hospital hygiene, ventilation requires pre-eminent regard. And if ever the phrase "well ventilated" may be (though indeed it never ought to be) at all indulgently construed in respect of a common dwelling-house, it must never, in respect of a hospital, be construed but with the utmost conceivable strictness.

There then lies the essential difficulty of hospital management,—a difficulty which many hospital administrators have found it easier to evade than to conquer. It is the difficulty of providing that throughout the whole of a really active hospital the means of cleanliness, and, foremost, the means of ventilation, shall be proportionate to the many special sources

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* Detailed considerations on the subject of hospital cleanliness, and generally on cleanliness in its relation to the sick, are so ably given in Miss Nightingale's two volumes of *Notes on Hospitals* and *Notes on Nursing*, that, even if the limits of my report permitted me (which they do not) to enter upon such considerations, I could not do better than refer to those well known works. I cannot do this quite unreservedly;—for some parts of the *Notes* (especially the parts which relate to the contagion of disease and to the interpretation of hospital records) are, for obvious reasons, not written with the same knowledge of facts as the parts on which Miss Nightingale is herself a high authority—the parts on cleanliness and on nursing. But while I necessarily take exception to the first-mentioned parts, I must express my strong sense of the general value of the books, and my sincere admiration of Miss Nightingale's exertions for hospital improvement.—J.S.

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of foul and infective material. If that difficulty be not successfully met, certain characteristic evils will sooner or later arise :—diseases which are communicable from person to person will show an especial tendency to spread in the hospital, from patients to nurses and other attendants and to visitors, and perhaps even among the patients themselves ;—and, among the surgical patients, wounds will show an especial tendency to deviate from the normal course of healing —an especial tendency to start certain peculiar morbid processes of their own. It is obvious that so far as those evils are in the ascendent, so far the usefulness of a hospital is lessened or annulled. And such being their high importance to the matter which is here under discussion, it seems to me right that I should speak of them separately and in some detail.

First, as regards the *spread of communicable diseases* :—each communicable disease has its own laws of communicability, —laws which must be properly understood if the danger of contagion is to be guarded against. The communication of some diseases (of scabies, for instance, and favus) is not by any true product of the human body, but consists in the migration of parasites, or germs of parasites, animal or vegetable, from one person's body to another,—a migration which of course the recipient may to any extent facilitate by dirty personal habits, and which, as regards some parasitic diseases, can scarcely be conceived to occur otherwise than in consequence of such habits. Other communicable diseases (and for hospital purposes they are the greatly important group for consideration) communicate themselves by that process which is distinctively called *zymotic* :*—in the first affected body, and by or with a specific chemical transformation of some of its material, there is generated or multiplied a specific *zyme*, *contagium*, or *ferment* ; which, if transferred while active to a second (not accidentally insusceptible) body, will there, according to the common law of ferments, excite

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* I take the present opportunity of suggesting, as in my opinion a most desirable amendment of present uses, that, in sanitary discussions, the word "zymotic" should never be employed but in its exact pathological sense.—J.S.

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the same morbid phenomena, the same chemical changes, as those amid which itself was begotten.[*] The several zymotic diseases are ætiologically quite distinct from one another.[†]

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[*] Some of the above expressions are meant to hesitate between two particular assertions. In this respect they correspond to the uncertainty which at present prevails as to the exact nature of some or all morbid ferments. A few years ago it might have seemed permissible to describe without reserve the contagia of the zymotic diseases, as but some changing organic material of the first affected body. At present, however, reserve on that point is necessary. That the power of contagiousness is associated with such changing organic material is certain;—but whether the power be *proper to the material,* or be only *contingently* its attribute, seems to require further investigation. The recent very interesting experiments of Professor Schröder in Germany, and of M. Pasteur in France (published respectively in Wöhler and Liebig's Annalen der Chemie, and in the Comptes Rendus de l'Académie des Sciences) aim at proving, most extensively, an essential dependence of specific fermentatory and putrefactive changes on the presence, in each case respectively, of some characteristic molecular living thing; and they give it to be understood that, if certain fermenting or putrefying organic matters tend by their contact to bring a given quiescent organic compound into chemical excitement like their own, this contagious power of theirs depends on their carrying with them those distinctive microscopical animal or vegetable forms which in each case respectively are the true agents of change. The conclusiveness of those experiments in the field to which hitherto they have been confined is still matter of the warmest scientific controversy; and while therefore it would be at least premature for me to insist upon them as evidence even in that field, it would be yet more premature for me to speculate on the possible results of an extension of similar researches to the pathology of zymotic diseases. But it is impossible to ignore their very important bearing in that direction . . .—J.S.

[†] How their respective first contagia arose, is, as regards nearly all of them quite unknown. This, in pathology, is just such a question as in physiology is "the origin of species." Indeed, regard being had to matters mentioned in the last footnote, it is hardly to be assumed as certain that these apparently two questions may not be only two phases of one. Hourly observation tells us that the contagium of small-pox will breed small-pox, that the contagium of typhus will breed typhus, that the contagium of syphilis will breed syphilis, and so forth,—that the process is as regular as that by which dog breeds dog, and cat cat, as exclusive as that by which dog never breeds cat, nor cat dog; and, prospectively, we are able to predict the results of certain exposures to contagion, as definitely as the results of any other chemical experiment. But, retrospectively, we have not the same sort of certainty; for we cannot always trace the parentage of a given case of small-pox or measles. And here, notwithstanding the obvious difficulties of proof either way, some persons will dogmatize that there must have been an overlooked inlet for contagium, while others will dogmatize that there must have been in the patient's body an independent origination of the specific chemical change. Presuming (as may pretty confidently be presumed) that in the history of mankind there was once upon a time a first small-pox case, a first typhus case, a first syphilis case, &c., and admitting our entire ignorance as to the combination of circumstances under which those first cases respectively came into existence, we have no scientific

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Also they differ widely in their manifestations, and have widely different degrees of importance; some of them being comparatively trifling local ailments, while others are fevers and fluxes of more or less considerable danger to life. The different ferments by which they severally are communicated have respective peculiarities of their own,—peculiarities which are primarily governed by the nature and anatomical relations of the morbid process in which each particular ferment

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reasons for denying that new "spontaneous generations" of such contagia may take place. But, as regards some of the diseases, there are conclusive reasons against supposing that this is of frequent occurrence. Where we can observe isolated populations, we find very long periods elapse without any new rise of certain "species" of disease. For instance, in 1846, the contagium of measles was imported by a sick sailor into one of the Faroe Islands, and led to an epidemic which attacked more than 6,000 out of the 7,782 inhabitants; sparing only the persons who previously had had the disease, and 1,500 who were kept out of reach of contagion; but before that time *there had not for* 65 *years been, in those islands, a single case of measles.* And the statistical return to which I have already often referred (Parliamentary Paper, 1864, No. 12.) contains another very striking illustration of the same sort of thing:—England has 627 registration districts. During the 10 years 1851–60, scarlatina, small-pox, and measles were (as usual) prevailing more or less throughout the country, producing among children under five years of age an average annual mortality of 802 per 100,000; *i.e.*, by scarlatina 419, by small-pox 103, and by measles 280. In 626 of the registration districts there were deaths (and, for the most part, in not inconsiderable quantity) from one or more of those causes;—not quite invariably from all of them; for 43 of the 626 (thanks no doubt, to vaccination) had not any death by small-pox, and among the 43 districts which thus escaped mortality by small-pox, there was one which also had not even a single death by measles;—but, with these exceptions, all the 626 districts had deaths from the three diseases—deaths by measles, deaths by small-pox, deaths by scarlatina. But the 627th district had an entire escape. In all the 10 years it had not a single death by measles, nor a single death by small-pox, nor a single death by scarlet fever. And why? Not because of its general sanitary merits, for it had an average amount of other evidence of unhealthiness. Doubtless, the reason of its escape was that it was insular. It was the *district of the Scilly Isles;* to which it was most improbable that any febrile contagion should come from without. And its escape is an approximative proof that, at least for those 10 years, no contagium of measles, nor any contagium of scarlet fever, nor any contagium of small-pox had arisen spontaneously within its limits. I may add that there were only 7 districts of England in which no death from diphtheria occurred, and that, of those 7 districts, the district of the Scilly Isles was one. Still to say that a disease is contagious is not to say that it may not arise without contagion. Indeed I shall presently adduce evidence to show the circumstances under which the "spontaneous generation" of the traumatic infections takes place. And the statements which were published in 1862 by Dr. Salisbury in the American Journal of the Medical Sciences, as to the producibility of measles by inoculation and other infection with *straw fungi,* deserve to be borne in mind.—J.S.

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originates:—all of them are essentially unstable and transitory, but, while some of them tend under ordinary circumstances to undergo a rapid extinction, others of them can with comparative ease retain their power for long periods of time, and some apparently have not their full force till some time after they have left the diseased body;—some of them associate themselves indistinguishably with one or more of the common excretions and exhalations of the body, others are separately tangible in vesicles and pustules or at ulcerating or suppurating surfaces, and may or may not also exist in other products of the body;—some of them are evolved in small quantity, others in very large quantity, or with very large natural admixture;—some of them are fixed, others but very scantily volatile, others as volatile as if they were vapours;—some of them operate easily on a second body by mere contact (more or less prolonged) with the outer or inner surface to which they are applied, others are not found to act unless they come into contact with accidentally abraded surfaces, or be thrust into the bodily substance by inoculation. Thus,—in vaccine lymph and in the matter of chancres respectively, there is a contagium which we know only in a fixed form, and only as communicable by intentional or accidental inoculation:—also ophthalmia and gonorrhœa and glanders are communicable by the fixed contagium which their pus contains; but this contagium does not need inoculation to infect the mucous membrane to which it is applied; and as regards ophthalmia, there are reasons for suspecting that to some extent the contagious pus may retain its activity when dry enough to float as dust in the air:—in some forms of milzbrand (including, probably, the so-called "malignant "pustule" which is the best known human form of the disease) the highly virulent fluids can, it is alleged, infect by soakage through the cuticle:—in diphtheria, the characteristic exudation is capable of infecting by contact; and though often the disease is communicated from person to person without any manifest transplantation of matter, it may be that in such cases particles of the decomposed false membrane are conveyed as a volatile contagion:—cholera and typhoid fever send forth their respective contagia for the most part, if

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not exclusively, as matter dissolved or suspended in the evacuations which pass from the patient's bowels; and probably these evacuations (which, at least in cholera, gradually develop their full infective force after their discharge from the body) can under some circumstances bring into similar contagious fermentation the excrement with which they are mingled in privies, drains, and cesspools, and can thus convert the effluvia and leakage from such sources into means of extensive secondary infection of air and water:—the volatile contagion of hooping cough is probably disengaged in large quantities by the air-passages, and as it forms is sent forth with the breath:—in typhus, small-pox, measles and scarlatina, the diffusion of volatile contagium occurs to a vast amount, probably with all exhalations from the body; and in addition to this, contagium, more or less fixed, collects abundantly about the patient's person and bedding; and, in a far less degree, something of the same sort probably occurs in erysipelas. It is evident that many of these contagia can scarcely be deemed sources of danger for well-conducted hospitals. If proper ward-discipline exists, no patient is allowed to expose himself to the risk of close intercourse with cases of contagious disease;—and, subject to that condition, most morbid poisons are of little effect except where the sanitary circumstances are grossly bad. Contagions which will not spread except by inoculation, or by the kindred agency of dirty bedding, or dirty towels, or dirty sponges, or dirty fingers, or by the drinking of polluted water, or by the effluvia from drains or cesspools, ought to be absolutely incommunicable in hospitals. So ought those to be, which will not spread except where pus, or matters like pus, are abundantly floating in the air.* But not all diseases which are capable of

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* The extent to which organic matter may be present as floating dust in such atmospheres as that of an ill-ventilated hospital ward, is only beginning to be recognised. A minute examination of external air for solid matters, which might perhaps be disseminated in it, had been made during the cholera epidemic of 1849 by Dr. R. D. Thomson, and the results of his inquiry (which, however, were negative) were communicated by him in 1850 to the Royal Medical and Chirurgical Society of London. Again, towards the close of the cholera epidemic of 1854 (when a Medical Council with a Committee for Scientific Inquiries was advising the then General Board of Health on matters relating to the epidemic)

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spreading in hospitals spread according to those types of uncleanliness. I advert to others in which the patient during many successive days and nights evolves, continuously and in profusion, volatile, highly diffusive, contagia. Such diseases are typhus and small-pox and scarlatina and measles. And it is peculiarly while they are being treated in a hospital, that the merits of the hospital ventilation may be tested. By no

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an inquiry of the same nature was, at the instigation of the Committee, made by Dr. Thomson and Mr. Rainey; and the results of this inquiry were published in 1855, with the report of the Committee upon them. Though again there were no results which could be deemed important in relation to cholera, Mr. Rainey gave some interesting evidence as to matter which may be suspended in the air. Floating in the air of the cholera ward of St. Thomas's Hospital there were not only minute hairs, particles of smoke, epidermic scales, vegetable fibres of different kinds and colours, starch granules, &c.; but also there were living forms, both animal and vegetable,—vibriones, namely, and the mycelia of fungi. Since that time, the inquiry has accidentally received a new impetus in the interest excited by M. Pouchet's observations, published in the Comptes Rendus of 1859 and 1860, as part of his endeavours to establish the spontaneous generation of rudimentary organic forms;—for though the gist of his evidence was to deny the diffusion of living organic germs in the air, he added new proofs as to the abundance of organic débris which even the external air may contain, and he devised a new apparatus for demonstrating the shaped ingredients of the atmosphere. Recently the inquiry has become important for my present subject. Two years ago, in the discussion of the French Academy of Medicine on the subject of hospital hygiene, M. Devergie mentioned some examinations of air which had then recently been made at St. Louis by M. Chalvet, house surgeon of that hospital, with the result of finding in the surgical wards a much larger quantity of floating organic matter than in the medical wards:—especially in the neighbourhood of cases of hospital gangrene there are, M. Devergie says, "enormous proportions" of such matter; and in an analysis which was made by M. Kullmann of some of the dustings or plaster from the rarely whitewashed walls of the wards, 46 per 100 was found to be organic matter,—"proportion véritablement effrayante, qui "transforme les parois de la salle en un foyer d'infection permanente, laquelle "infection varie en plus ou en moins suivant la condition de l'atmosphère." M. Chalvet's experiments were suggested by some which M. Reveil had previously made (with substantially similar results) at La Riboisière. In 1861, Dr. Eiselt of Prague stated that, during an epidemic to ophthalmia which had recently prevailed in the Foundling Establishment of Répy, he had been struck with the fact that elder persons (including himself, the surgeon to the establishment, and several nurses) were attacked with the disease,—persons whose eyes certainly had not had, in the ordinary sense of the word, any contact of purulent matter; that this fact suggested to him to examine such matters as he could collect (with a modification of Pouchet's aeroscope) from the air of one of the wards;—that he did this one morning "after the ward had been ventilated," taking for his aeroscopic station the space between two beds in a ward where there were 33 cases of acute purulent ophthalmia;—and that after the first passage of air through the instrument, puscorpucles were evident on the glass. *See* Zeitschr. der k. k. Gesellsch. der Aerzte in Wien, 1861, Wochenblatt 13.—J.S.

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known resource of science can it be contrived that patients suffering from those diseases shall not be probable sources of infection to persons of normal susceptibility, who, for the first time, come into close relation with them. Fortunately it happens that to have once had any of those diseases is, generally speaking, a protection against having the same disease again; and that to have been properly vaccinated (all the more if re-vaccination after puberty have been performed) is almost perfect security against any serious danger from small-pox. Persons of adult age, who are likely to be in attendance on the sick, are nearly sure to have had measles, for its contagium is universally current in this country; and for a similar reason they are very likely to have had scarlatina and (if they have not been vaccinated) small-pox. Thus, as regards those diseases, such persons are in great part an insusceptible population. But not so with typhus. For happily the contagium of this terrible fever is of comparative infrequency among us;—and when epidemics of it occur, it must very often be the case that those who are nursing the sick have themselves never had typhus, nor ever before encountered typhus contagion. Of such persons, a certain considerable proportion will, notwithstanding any hitherto known perfection of sanitary circumstances, be found to contract the disease. And the same sort of danger will of course affect them when ministering to the sick with small-pox, scarlatina and measles, if from any cause they still happen to have susceptibility for those diseases. In the present state of knowledge it cannot fairly be deemed ground for presumptive condemnation of a hospital, that typhus, or any of the last-mentioned diseases, spreads to some of the persons who are in attendance upon the sick. There is inevitably a certain quantity of danger to be encountered, and that danger, even when reduced to its minimum, will not fail to be represented in its result by a certain quantity of suffering and death. But the quantity varies according to the sanitary circumstances. Even as regards nurses, who do every personal office about the sick, the danger of contagion ranges, as ventilation and cleanliness range, from a minimum—which, in their case, unfortunately, is always a considerable danger—to a maximum, which means

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that perhaps half or a third of them will die. So, too, as regards those officers and servants whose attendance on typhus-patients is less frequent and less close, the range of danger, though from a very much smaller minimum, still reaches to a maximum of very great danger. And these worst degrees of danger, incurred by sanitary fault, cannot exist without great concurrent probability that the sphere of their operation will widen,—that patients who have come to the hospital to be treated for perhaps some comparatively trifling ailment will contract a fever which may kill them outright, or may give them months of suffering and incapacity,—and this, notwithstanding that the ward-discipline has been strict, and the conduct of patients obedient, with regard to the avoidance of all near personal intercourse.

From considering the spread of contagion in hospitals as (under some limitations) one evidence of hospital unsuccess, I now turn to consider that other evidence which consists in the origination of certain forms of disease.

In ill-kept hospitals wounds go on badly. Instead of running their normal course of repair and recovery, they—whether accidental wounds, or wounds made by operative surgery — undergo certain characteristic morbid changes. Erysipelas will frequently attack them. So will other morbid processes akin to erysipelas,—such morbid processes as those of gangrene and phagedæna, and putrefactions of effused or otherwise stagnant blood, and re-opening of half-healed arteries and veins, and septic and suppurative infections of the system, and so forth,—morbid processes, which, with erysipelas, may for my present purpose conveniently be generalized under the one name of *traumatic infections.* And if the hospital receive lying-in-women, these infections will constitute different forms of so called puerperal fever.

Traumatic erysipelas is a true zymotic disease,*—a disease in which the affected materials of the body furnish a specific contagium. On but too many occasions the contagiousness of the disease has been convincingly and fatally proved ;—enough,

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* This is equally true of the non-traumatic erysipelas,—the pathology of which disease, however, needs not here be particularly discussed.—J.S.

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perhaps, had there been only such evidence as is adduced from hospital surgery;—but still more by evidence, again and again given, that a surgeon going to a puerperal woman from attendance on a case of erysipelas may convey the specific contagion to the uterine surface of his new patient, and occasion her death by that form of puerperal fever which under a special name is in fact but intra-abdominal erysipelas. But to say that the disease is contagious is not to say that no case of it can arise without contagion from a previous case. Indeed in this respect erysipelas has a peculiar place among the zymotic diseases. Probably, of all the specific contagia, the contagium of erysipelas stands in nearest affinity to the ferments of common cadaveric decomposition, and is therefore aptest to rise de novo whenever certain animal textures and juices, or the effluvia from such textures and juices, are falling into common putridity. Immense mortality from puerperal fever in one division of the Vienna Lying in-Hospital, varying from about a fourth to about a ninth part of all the deliveries which took place there, was believed by Dr. Semelweiss, the head of the department, to depend on an infection of which "the *real source was to be* "*found in the hands of the medical men in attendance contaminated with cadaveric poison.*" The other division of the hospital (reserved for the practical instruction of midwives, whose training does not require them to be brought into contact with dead bodies) suffered only about a tenth part as much as the first; and this was the more noticeable as the second division was inferior to the first in the size and airiness of its wards. Dr. Semelweiss, acting upon his supposition as to the cause of the disease, required that the male attendants of the first division should, as much as possible, avoid contact with cadaveric matter; that after such contact they should never make a vaginal examination till the following day; and that, besides very thoroughly cleansing their hands, they should systematically *disinfect them with a solution of chlorine.* The latter precaution was not introduced till some months after the more general precautions had been adopted. The result of these measures was, that the mortality of the first division at once fell to

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the usual average of the second division. In 1846 the death-rate per cent. had been $13\frac{2}{3}$; in 1847 it was $5\frac{1}{5}$; in 1848 it was $1\frac{1}{3}$.* And the relation of this fact to the possible "spontaneous generation" of erysipelas contagium is not, I think, far to seek. For any wound in the unhealthy state which is technically called "foul" is in fact a surface of decaying animal matter; that which surgeons call a "slough" or "mortified part" is a dead bit of the animal body undergoing just such putrefactive changes as it might undergo in the dissecting room; and accordingly, if cadaveric decompositions can easily furnish the contagium of erysipelas, every surgical ward of an active hospital must (in respect of the natural processes of disease which are going on in it) be a likely birth-place for that contagium. Thus, for instance, if a patient has been admitted with a contused wound of such severity as involves local mortification, that mortification would include in itself an essential liability to the formation of erysipelas contagium. Whether the contagium, if thus engendered, produces in that particular patient the spreading surface-inflammation which characterises erysipelas, may depend on his personal susceptibility, and specially, no doubt, on the then-existing chemical state of his live textures next adjoining the wound:—but, whether his general mass of body be or be not infected by the specific contagium which has been engendered in his wound, in any case contagium would be set free, and would act on the atmosphere of the ward Its influence in this atmosphere would be determined by circumstances: if the ward were well ventilated, dilution or oxidation would probably have rendered the contagium inert before it had travelled far from its source; but if, on the other hand, the ward were ill-ventilated, either absolutely or in proportion to its contained quantity of ill-conditioned surgical cases, then probably the unclean atmosphere would abound with material which the contagium could convert into its own likeness; and such an atmosphere, continuous through the whole length of the ward, and perhaps receiving increments of new formed con-

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* See Dr. Routh on the Epidemic Puerperal Fever of Vienna, Med. Chirurg. Trans. XXXII.—J.S.

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tagium from other beds than the first, would be so very dangerous an influence to even the best-conditioned wounds that probably there would be in the ward what is called an "epidemic" of erysipelas;—and, in addition to the danger that the contagion might thus by continuity of atmosphere spread from one patient to others, there is also danger, except with the cleanliest and most careful nursing, that attendants will convey it from one part of the ward to another in the successive wound-dressings which they perform.

Of the other traumatic infections, the zymotic relations are not quite so clearly established. The immediate cause of pyæmia in any given case is that some diseased part (which, however, needs not be an external * wound) so affects the blood circulating through it, that this blood afterwards excites destructive suppurations in parts to which the circulation carries it,—viz., commonly first in the lungs or (in certain cases) liver and lungs, and later generally about the body. Perhaps in its completest form, but certainly in great part, pyæmia can be experimentally imitated in the lower animals by the injection of a little normal pus into a vein. And there is not, I think, any valid reason for doubting but that this kind of material infection of the blood, accidentally arising, is the essential cause of human pyæmia;—and this equally, whether the pyæmia be in connexion with internal disease, or be in that more familiar surgical combination which has here to be particularly considered. Of all traumatic infections, of all mischances to which major surgery is subject, pyæmia is by far the most fatal.† Its attacks under

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* In a case of which I was cognizant (and which Mr. Bowman describes in his Lectures on the Anatomy of the Eye, p. 127) fatal pyæmia in a young gentleman was apparently produced by the accident that an ulcerated state of the mitral valve of his heart, where perhaps there had been a small primary abscess, allowed inflammatory products to flow into the blood of his left ventricle. In another case which I remember, fatal pyæmia was produced by the penetration of pus from a small mesenteric abscess into the thoracic duct, whence of course it passed on to the right side of the heart. And in several instructive cases published by Dr. Bristowe in the 13th volume of the Pathological Transactions, pyæmia is shown as occasionally complicating almost ab initio cases of idiopathic necrosis unattended by external wound.—J.S.

† Neither as regards the general population, nor as regards hospital practice, have I any means of stating in what *quantity* pyæmia prevails. But, as regards the *proportion* in which deaths from pyæmia stand to deaths from all causes in

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ordinary circumstances are happily not frequent, but it kills nearly all whom it attacks. Not all surgical patients having wounds have an equal, or nearly equal, liability to it. It shows an almost infinite preference for the cases where bone-structure (particularly cancellous bone-structure) has been injured, as in compound fracture, or in the surgical procedures of amputation and resection, and all the more perhaps in proportion as the injured bone is large. The other cases in which it occurs are principally those in which large vein-trunks have been involved in the traumatic inflammation. The local changes which in either sort of case precede and introduce the pyæmia are not hitherto well understood. But we know that very often they are part and parcel of a process which is not simply suppurative, but involves also much foulness of wound; and we know that among them the putrefactive softening of local blood-clot and other fibrinous matter has generally an important, if it have not always an essential, place. For commonly, till they set in, there will have existed protectively in each injured vein of the part firm blood-clot of greater or less extent, closing the vein towards the focus of traumatic irritation; but now these barrier-clots, undergoing just such a change as clot undergoes when it putrefies after removal from the body, soften and fuse away, partly at least into the circulation,—where apparently it is the ferment-action of their material, or of material which their fusion lets enter from adjoining sources, that establishes the pyæmic state, and therewith usually more or less of common putrid infection of the blood. That pyæmia so often pre-supposes a local working of putrefactive ferments, is a fact which concurs, I think, with other evidence to suggest the pathological affinities of the disease. And the fatal significance of putrefactive ferments in relation to the traumatic infections probably does not end here. Probably

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hospital-practice, I may refer to a table which the reporters give. The materials are far too small to justify any but the most moderate and negative conclusions. But, such as they are, they show pyæmia causing 50 out of 2,874 deaths in the London hospitals, and 37 out of 1,086 deaths in the country hospitals;—*i.e.* about 17 per 1,000 in the former, and about 34 per 1,000 in the latter. It must be remembered that in these quantities of pyæmia, *all* pyæmia—non-surgical as well as surgical—is included.—J.S.

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the putrefactive softening of blood-clot plays an equally important part in relation to the occurrence of secondary hæmorrhage from tied arteries,—a part far more important than the mere anatomical conditions to which, in the older literature of this subject, a too exclusive consideration has been given. Finally, that also phagedænic and gangrenous processes are in their very essence processes of death and putrefaction for the parts which they affect, is a fact which is on the very surface of their pathology; and that at least some of these processes are true zymotic diseases, is rendered probable by very strong considerations of analogy, as well as by statements which have been published of their inoculability from patient to patient.*

An attack of any of these traumatic infections has generally the same meaning as an attack of traumatic erysipelas. It is true that any member of the whole series—erysipelas, pyæmia, softening of clot, gangrene, phagedæna—may, within a large surgical experience, occur to some considerable extent from causes which are purely personal.† And (especially where such is the origin) one of them may occur without the others. But, except where personal conditions exclusively decide the occurrence of these lamentable infections (and clearly this is only to a limited extent) they tend to prevail conjointly or in succession. That they differ somewhat from one another in the intimate nature of their respective

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* See, for example, Thomson's Lectures on Inflammation; 1813;—p. 484. —J.S.

† "Foulness" of wound-surface is, in a very large number of surgical cases, a necessary transit to recovery, being merely the gradual exfoliation of particles which the first severe onset of disease or injury has killed; and, among cases of grave injury, it very often happens that wounds (as containing either much crushed and killed texture, or much effused and stagnant blood, exposed to common atmospheric influences) will be seats of such considerable putrefaction as must necessarily infect, in a very dangerous way, the respective patients whose parts are thus affected. Any septic infection which the general atmosphere of a somewhat ill-kept hospital ward could bring to such a patient would be small, when compared with that infection which his own foul wound occasions him. Nor must it be forgotten that personal predisposition (varying with the quality of previous health) counts for a very great deal in determining the course which a given wound shall take,—so that, quite irrespectively of sanitary circumstances, a patient of damaged health will often undergo extensive sloughings or ulcerations, or more definite traumatic infections, which another patient, similarly injured, but otherwise of good health, would quite escape.—J.S.

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chemical processes is possible or even probable;—but that they have in common an intimate affinity with ordinary putrefactive processes seems to be the leading fact in their pathology. Provisionally I regard them all as zymotic diseases, the respective contagia of which may arise in any putrefaction of wound-products. And this view of their nature tallies both with their just-mentioned tendency to prevail more or less together wherever any one of them prevails largely, and with their tendency thus to prevail only in concurrence with certain sanitary circumstances. In order that an epidemic outbreak of these diseases in a hospital ward shall be possible, there must, it seems to me, always be this sanitary fault;—that the ventilation of the ward (even though it be, in common parlance, fairly good ventilation) is inadequate to the quantity of traumatic impurity generated in the ward,—that thus there prevails throughout the ward, or in sections of it, an atmosphere which contains much decaying animal matter of the kind which wound-surfaces contain,—and that any zymotic change arising in this atmosphere, or on any wound-surface which exhales into it, has peculiar chemical facilities for infecting other wound-surfaces within the range of influence.

The hospital experience of past times abounds with dreadful illustrations of the extent to which this influence may operate in wards which are, in the popular sense of the words, "overcrowded" and "ill-ventilated." When John Howard (not quite ninety years ago) was writing on these matters he described hospitals where it must have been a rare thing for an important surgical case to recover.* And though horrors

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* See *passim* his famous work, or even the following reference to it in Sir Gilbert Blane's admirable paper on the prevalence of different diseases in London:—
" It is a remark of Mr. Howard, in the account of his visitation of prisons and
" hospitals, that at the hospital at Leeds no case of compound fracture nor trepan
" survived, till the ventilation of the wards was improved. This was effected by
" causing large openings to be made over the doors leading to the passages. At
" the Hôtel Dieu, formerly so notorious for its filth, bad air, neglect, and
" crowding, no operation for the trepan succeeded during the whole time that
" M. Marceau was chief surgeon, which was fifty years, insomuch that the
" operation was laid aside. Such are the circumstances which engender the
" hospital gangrene, and are to surgeons what typhus fevers are to physicians.
" The air may not be so foul as actually to generate these evils; but in any

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of that sort may now fairly be deemed to have become impossible for civil hospitals, yet, in times long subsequent to Howard's, something not very dissimilar might be seen in military practice; and the annexed report [A] will show that sometimes, even recently, considerable prevalence of traumatic infections in civil hospitals has been due to gross faults of crowding and non-ventilation. I refer particularly to the series of instances which the reporters give [A]; and I may also advert to the striking illustration which I gave in my report of 1858 from the experience of a large lying-in hospital.* I may add, too, that the far less prevalence of traumatic infection in London than in Paris seems to be exclusively due to the far better system of ventilation which is general in London.

It often occurs that traumatic infections are for long periods absent from wards which even to the popular eye are overcrowded and ill ventilated, and that in wards which do not obviously offer any such defect the diseases may have considerable prevalence. But the meaning of this apparent anomaly is (as I shall hereafter more particularly explain) that the zymotic effects of overcrowding and ill ventilation may be greatly augmented in intensity in proportion as certain kinds of disease are kept, each kind by itself, instead of being mixed and diluted with cases of other kinds of disease;—that, for instance, traumatic infection may, notwithstanding inferior sanitary circumstances, be absent from a mixed ward in which but few cases of wound are present, or in which the severe cases are in minute proportion to the remainder; though perhaps the substitution of two or three

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" degree it retards sensibly all cures, whether surgical or medical; and it indis-
" pensably behoves all those who have the superintendence of hospitals not to
" rest satisfied with anything short of perfect purity. Without this the most
" skilful treatment is thrown away. At the time in which the Hôtel Dieu was
" so greatly mismanaged there were seen three, four, and even five in one bed.
" The rate of mortality was that of one in four; hardly any acute cases, child-
" bed cases, or capital operations survived. About the beginning of this century
" a remarkable improvement took place in the conducting of this hospital. Of
" late times it has been well ventilated, never overcrowded, cleanliness carefully
" studied; the result of all which has been that the mortality is that of one in
" eighteen."

* See above, Vol. I., p. 477.—J.S.

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compound fractures for two or three simple fractures in this ward would suffice to develop there an epidemic of the infections in question. Also it deserves notice, that the chemical power of some of these contagia seems rather apt to linger (in spite of all ordinary cleansing) in wards which have once been thoroughly unwholesome with it,—seems as though it could to some extent fix itself to the absorbent wall-surfaces of wood or plaster. Thus, there cannot, I think, be any doubt but that in the hospital-ship "Dreadnought" this kind of zymotic taint in the walls has operated injuriously on the sick; and if the same thing cannot be equally well proved with regard to ordinary land hospitals, that, perhaps, is only because with them the same kind of experiment has not been so distinctly made.*

In the preceding observations I have endeavoured to express what in my opinion are the pathological principles on which hospital unsuccess may be judged and measured in the two matters where it is most apt to betray itself. I have taken care to exclude the supposition that an occasional

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* In my report of 1858, I wrote as follows on the then experience of the Seamen's Hospital:—"The old hospital ship 'Dreadnought' had acquired a very "evil reputation for the prevalence of these infections; dependent, no doubt, in "part on the natural ill-adaptedness of a ship to the purposes of a hospital; but "probably also in part dependent on organic contamination still lingering in the "wooden walls of the wards. Early last year another more commodious ship "was substituted for the 'Dreadnought;' and Mr. Tudor, the resident surgeon, "informs me that, whereas, in the two years preceding that change, 9 out of "22 amputations had terminated fatally, only one amputation had proved fatal "out of 16 performed in the year following the change; and that, whereas "formerly erysipelas and hospital-gangrene were so common and so spreading "as to have let him see there at one time as many as 18 cases of "hospital-gangrene, he has now scarcely seen erysipelas, except in patients "admitted with it, from whom as a rule, it no longer spreads to other inmates "of the ward." Thus far, it will be observed, the change had been all for the better. But little by little since that time the old state of things has returned. And now the report made of the ship (see p. 719) is, that traumatic infections are "excessively frequent," that "operations do very badly," that "pyæmia is "frequent." The obvious explanation of this history lies, I think, in the suggestion made in the text. I may add that in my experience of the former St. Thomas's Hospital, I had very strong suspicion that at least one of the old wards suffered from that kind of chronic taint. And M. Kullmann's analysis of the wall-scrapings of the wards of St. Louis (quoted in a previous foot-note) may serve, though as a very extreme instance, to illustrate the liability of which I speak.—J.S.

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solitary case of some traumatic infection, or an occasional communication of (say) typhus from patient to nurse, is, even pro tanto, proof of unskilful hospital management. I have conceded (what indeed every pathologist knows) that to some extent such events occur without any discoverable relation to conditions of uncleanliness,—that wounds will often become unhealthy from causes strictly personal to the patient,—that typhus is so powerfully contagious a disease that persons who are immediately about the sick will in very large proportion, sooner or later, have an attack of it. But of evils which are capable of gradation from small to immense proportions, surely even the smallest degree should be matter for jealous scrutiny. Hospital managers will hardly work their hospitals to the fullest advantage, unless they be vigilant even as to solitary originations of traumatic poison, and solitary cases of hospital contagion. And at least it ought to be accepted as an axiom in hospital management, that any *concurrence of cases* of traumatic infection originating within the hospital, or any spreading of febrile or other contagion to even a single *patient* within the hospital, is conclusive reason for inquiring whether the fundamental difficulty of hospital management has not here been unskilfully met.

Evidently in either case the inquiry ought particularly to be made with regard to the ventilation of the wards,—so particularly, that for my present purpose I may consider this to be the only question at stake.* If typhus spreads from bed to bed in a ward, or if traumatic infections prevail there, presumably the ventilation is not proportionate to the number and kind of cases under treatment.

Presumably there is one of these three faults: either (1) the ward, from its original construction, has not means of being

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* Of course, where typhus has spread, it may appear that patients have been in improperly close personal intercourse. If a patient who is susceptible of typhus frequents the bed-side of a typhus-patient, no ventilation of the ward can give him more security against contagion than it gives to nurses and doctors. But, as I stated at a former page, no such intercourse ought ever to occur; and, in any well-regulated ward, ample vigilance would be used to prevent it. In order to avoid the necessity for incessant qualifications of language, I assume in the argument of my text that that proper ward-discipline is in force.—J.S.

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well ventilated; or (2) the ward has means of being well ventilated, and the administration of those means has been neglected or bungled; or (3) patients of one kind (traumatic or typhus) have been gathered together in such proximity that no practicable ventilation suffices to disinfect their atmosphere. And to each of these three possibilities the inquirer must give separate consideration.

So thoroughly does a hospital depend for its usefulness on the capacity of its wards for the most exquisitely perfect ventilation, that in all plans of hospital construction this is the one cardinal virtue to be insisted on. The ventilation must be such as shall leave no corner unsearched by its currents. These, within the wards, must never for a moment cease flowing from inlet to outlet,—must be flowing so largely that every unwholesomeness is at once removed by them, yet so gently that they are almost or quite unperceived as currents, and so evenly that no inmate of the ward can complain that his place is unfairly scoured by them. In theory the most desirable arrangement of ventilation would be, that fresh air, proper in temperature and otherwise, should diffuse impartially from about the middle point or middle line of the ward, and that the outflow of air should be by openings respectively placed above the several bed-heads in the ward. Evidently this conception could not be realized except in some system of artificial ventilation, wherein the currents would be determinately regulated, and wherein the arriving air would in case of need be modified in temperature or otherwise. Of course, there is not in that problem anything essentially impracticable, nor perhaps even extremely difficult, for physical science to accomplish. But hitherto it is unsolved. Hitherto, I believe without exception, plans of artificial ventilation for wards have been costly and fatal failures. And in the present state of knowledge, the utmost that can be said for them is that some of their appliances (specially those for withdrawal of used air) may advantageously be used as additions to that more natural ventilation which, at least in this country, has appliances provided for it in the common conditions of decent house-construction. Open windows and (as substitutable for them in certain states of weather) other direct, but less drastic, air-holes through the walls of the ward, are at present the essential *inlets* for fresh air.* They also, under many circumstances, are the *outlets* for used air:—but in this function chimneys co-operate with them,—acting, when fires are alight, very serviceably as outlets; and it never can be otherwise than advantageous to the ventilation of a ward that subsidiary shafts should give a greatly increased development to the resources of that ordinary chimney-action. For in-ventilation, then, our reliance must be upon direct air-holes, of which open windows are the chief; on these same means we must also, under ordinary circumstances of construction, rely for a large share of out-ventilation; and thus, whatever other appliances exist, a ward must be perfectly ventilable by its windows. Now, hospital construction has pro tanto failed in its first obligation, if the form and arrangement of wards, and the distribution and planning of windows, be not such that each separate ward (independently of all other wards, and of all staircases, passages, corridors, and offices) shall admit of that kind of ventilation in its completest possible form. An oblong ward, from 25 to 30 feet wide,—windowed correspondingly on its two long sides with sash-windows reaching to the top,—and windowed in such proportion to wall that between each two windows there shall be the required space for one bed-head,—and having its communications and separately-ventilated offices at its two ends;—this, by common consent, is the form of ward which best of all answers the proposed purpose.† And in proportion as this

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* Contrivances by which the effect of direct air-inlets is mitigated in relation to the inmates of a ward are principally of two kinds:—(1.) The air passes through a sieve of perforated zinc, by which its force is broken and its coldness somewhat lessened; or (2.) by means of some special ventilator, the current of incoming air has such a direction given to it, that, before it can directly affect any inmate, it must diffuse considerably in the ward, and merge its cold in the average temperature of the ward. Mr. Brotherton, of Manchester (in his pamphlet on Hospital Construction published in 1856) has well shown the advantages of a system of air-holes, covered with perforated zinc, when set facing one another along the two opposite sides of a ward. [And, in our present time, the value of Tobin's ventilating-tubes has to be remembered.—J. S. 1887.]

† On what plans of construction several wards may be combined into hospital-wholes, is a matter of little or no sanitary importance,—provided always that one ward does not impede the ventilation or lighting of another, and presuming of

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form is departed from, in such proportion, sooner and sooner, will the limit of the ward's usefulness be reached,—the point, namely, at which ventilation will prove insufficient, —the point at which typhus will spread from bed to bed, and at which traumatic infections will arise among surgical cases.

Whether a ward's existing means of ventilation are properly utilized, is a matter of ward-discipline, which, like all such matters, requires extreme vigilance on the part of directing officers. And such officers, in addition to their other qualifications, ought to be persons of extremely acute scent for every uncleanness which can vitiate the air. It would be idle to deny that, in this catarrhal climate of ours, ventilation by open windows has its inconveniences. Unfortunately there are times when those who regulate such ventilation must

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course that each ward in itself is healthy. If the contagious fevers respectively are treated in separate wards, the object of their separation will be somewhat more completely accomplished if the wards allotted to each fever respectively are made into separate blocks, so that the medical attendants and others—in going, for instance, from their smallpox or scarlatina patients to other patients, must always pass through the open air. But, otherwise, I am not aware of any important sanitary object to be gained by that kind of separation. The notion that a large general hospital cannot be healthy unless it be broken into so-called pavilions, each of which shall have but two stories, has not, I think, any sufficient foundation in facts. In 1858 this subject was discussed in connexion with the plans for Netley Hospital; and I cannot better express my present opinions about it than by quoting what I then wrote in answer to a reference from the War Office:—" In some of the papers which you have communicated to me, " pointed allusion is made to a so-called *hospital atmosphere*, as a danger specially " incidental to buildings where many patients are congregated *under one roof*. " In reference to this I would observe (first repeating my conviction as to the " paramount importance of ventilation in every building intended for the sick) " that, if by the above-quoted expressions it be meant that *patients in clean, well-" ventilated, and not over-crowded wards, with separately well-ventilated pas-" sages and staircases, are apt to breed an atmosphere* [which, along passages, " or through floors and ceilings, or up or down staircases, will be] *dangerous to " those under the same roof with them*, I have no information which could lead me " to accept the doctrine. Under opposite circumstances, the continuity of foul " atmosphere might indeed be dangerous. But as regards wards kept as wards " ought to be kept, I cannot conceive that the several clean items will make a " dirty total; and, so far as my present knowledge extends, I have every reason " to believe that, *subject to the qualifications I have stated*, a given number of " patients may dwell under one roof as safely as under several roofs." Nor, subject to the same qualifications, have I any reason to suppose that patients will not recover so well on upper as on lower stories. Of the various surgical wards in which my own hospital experience has been, the one which I remember with most satisfaction was a top ward which had three stories of wards under it. —J.S.

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admit the air but scantily, lest its cold should do even more harm than its freshness will do good. And there are times when the best possible choice between these two evils will not absolutely exclude a certain admixture of both of them;—when, at least as regards a mixed ward, the ventilation is perhaps far less than we should desire for the case of typhus or of compound fracture, yet the temperature lower than can be well borne by the patients with sensitive air-tubes and the patients with Bright's disease. To get the best attainable adjustment, it is requisite that those who superintend the sanitary management of the hospital, and especially those who visit the wards at night, should bring to their task, not only some skill, but great attention to details, and thorough pains-taking patience. The difficulties are at their minimum where wards are constructed as they should be. They go on increasing in the ratio in which construction shows worse, till, with some forms of ward, no two bed-spaces can be ventilated but by gusts brought across other bed-spaces, and every attempt at efficient general ventilation provokes cries of inconvenience or injury from a large proportion of the ward's inmates. It is with reference to this dilemma that hospital managers have to estimate the supreme importance of a good first construction of the hospital:—for the working capacity of a ward has to be rated, not according to a theoretical estimate of how many beds may stand upon its floor, but according to the practical issue—how much of a given kind of disease can safely and successfully be treated there; and clearly the cost of hospital construction is not cost wisely incurred, if the wards, by faults of construction, lose half or more of the working capacity which their cubic dimensions are supposed to give. Yet even with the best construction the difficulty is not quite at an end. Nor perhaps will it entirely cease till, with the progress of mechanical invention, it can be contrived that ventilation, in other respects perfect, may at will be rendered warm or cold. But meanwhile (without pretending to dogmatize on a subject which I practically know to involve a great variety of considerations) I would express a doubt whether, with our present appliances, the real minimum of the difficulty can be attained, unless, in the warding of patients, cases be classified, as far as possible, on the basis of their respective requirements of ventilation and powers of tolerating cool air.

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It is in my opinion a fact of much importance for hospital success, that the two dangers of which I am particularly speaking (the danger that febrile contagion will spread, and the danger that traumatic infections will arise) vary considerably in amount according to the arrangement of cases. Each patient with certain sorts of fever, each patient with certain conditions of wound, is the source and centre of a specific air-pollution, which ventilation (as it is good or bad) tends more or less rapidly to neutralize, but which (notwithstanding even good ventilation) necessarily extends to some distance from its source. Never ought any patient to lie within range of any other patient's morbid odours or of any other patient's contagium. Invariably beds ought to be so far apart, and the spaces between them to be so well ventilated, that under most circumstances no such dangerous nuisance can be expected to occur. Whenever, with any extraordinarily infectious or offensive case, the interspaces appear to be insufficient for perfect safety, it will be right that the next adjacent beds should be left unoccupied; and if the emanations from any one patient are either so unmitigably fœtid, or (as the reporters believe of smallpox) so diffusely contagious, that no distance in one ward will suffice to render them innocuous, then a case arises for separate treatment;—treatment which in the latter case, would be in wards special to the one disease, but in the former case might have to be in isolation.* But in my opinion the arrangement of patients in a ward ought to go even beyond what I have yet insisted on. Not only

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* The object of such an isolation would of course be equally well attained if a sufficient separate out-ventilation were given to the one patient's bed, by bringing it into connexion with an out-cast ventilating shaft. Arrangements by which this kind of special ventilation could be provided for such cases as might require it would, I think, be among the most useful additions which could be made to our present hospital appliances. And hints for the purpose could be gathered from the contrivances by which, in some factories, hurtful dusts which a manufacturing process engenders are, as they form, withdrawn from within the work-place by currents of out-cast ventilation, adapted by hoods to each dust-producing machine.—J.S.

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ought not any one patient to be within the sphere of any other patient's air-pollution, but also great pains ought to be taken lest similar spheres of air-pollution coalesce (if I may so express myself) at their circumferences. Especially this has to be thought about with regard to cases of typhus, and with regard to cases of severe surgical injury and operation. When several cases of either of these sorts are set together in a ward, generally it may be seen that a new increment of danger accrues in the mere fact of their propinquity,—more than common disposition of the typhus contagium to spread from patients to nurses in the ward,—more than common disposition of the wounds to fall into zymotic processes. With utopian spaciousness and ventilation, such perhaps might not be the fact. But in our actual circumstances it is greatly so, and the danger must be distinctly regarded. The cases of like nature must either be considerably separated by intervening different cases, or, if they be kept in groups according to their nature, they must, on this account, have an increased allowance of space.* In

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* Mr. Whitfield, the resident Medical Officer of St. Thomas's Hospital, who has always had his home in that hospital, and can speak with intimate personal knowledge of the last 45 years of its experience, tells me some interesting facts in corroboration of the above argument. In 1818 (when he began to attend the practice of the hospital) and for some years afterwards, the wards used to be in common for medical and surgical cases; and in those days, though no doubt the sanitary management of the hospital was not so good as it afterwards became, there was not in his recollection any decided propagation of fever among the patients, nor, except very rarely, any communication to nurses or sisters in the wards. In 1828, or soon afterwards, the separation of medical from surgical cases was made, and separate wards (one for males and one for females) were allotted to each physician; and each physician received patients in weekly turn with his two colleagues. Under this system, whenever there was an epidemic of fever, the worst fever cases of each week were sure to get gathered together into particular wards. And now fever spread. "The sisters, nurses, and pupils not "only became victims to the condensation of infection, but the mortality was "great, so much so that the Governors called upon the medical men to adopt "some measures for its amendment. The plan then proposed was to limit the "cases of fever in the old wards to 4 in each, and the new wards (north wing) "then recently built, to 6." And now the old immunity returned. "On the "plan being carried out, it is but fair to say that with few exceptions it was "attended with the most marked success; though, that an occasional case of "typhus or scarlet fever has been communicated from patients to patients, or "to the nurses in the hospital, it would be vain to deny." Under the severe pressure to which the hospital was exposed in the first half of 1862, when typhus

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surgical practice, especially, this matter requires particular attention:—for it is the custom of all large hospitals to separate the surgical from the medical cases, and in many of such hospitals there are further classifications which tend to throw very much together into special wards the graver kinds

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was severely epidemic in London, 10 nurses and 5 patients apparently contracted typhus from 98 cases admitted with that disease. Within about the same time, 14 cases of scarlatina were admitted, and 1 nurse and 1 patient caught this infection. Since that time St. Thomas's Hospital has been very inadequately represented by an adaptation of the quondam Music Hall of the Surrey Gardens. Into this building 33 cases of typhus have been received, and its contagion has affected 3 attendants, but happily no patient. Of scarlatina, 21 cases have been received, and its contagion has unfortunately affected 1 patient as well as 3 attendants. Cases of typhoid fever have of course always and abundantly been under treatment; but I have no information that contagion has ever spread from them. With reference to the sad extension of typhus in the old hospital in 1862, Mr. Whitfield mentions that of the 5 patients who apparently contracted typhus from other patients, only 1 was in the admirably constructed modern part of the hospital, the other 4 having been in the old wards, "which, it will readily be " admitted, were not constructed on the most modern or best principles." And with particular reference to the large number of nurses who suffered, Mr. Whitfield writes as follows:—" On finding that there was great nervous depression " amongst the sisters and nurses (not only in consequence of the patients in the " house, but from the reported mortality in other hospitals of some of their " sisterhood) I allowed to each in the medical wards two glasses of wine per " day. From that time, with one exception, not a single nurse took the fever; " and what is a remarkable fact, the one solitary nurse who caught it was one " who would not take the wine." Mr. Whitfield's conclusion (and it is one to which I attach much importance) is, " that with a still greater separation than " would be considered necessary for the ordinary run of disease, we might hope " to admit fever and other infectious diseases during an epidemic without prejudice to the other patients. The plan would be, for the time required, to greatly " diminish the number of the beds in the wards to be given up for the emergency, " especial care being enforced that the beds appropriated to fever, &c. had a " sufficient superficial space allowed to them, and not to over estimate the " cubical contents of the wards, as an equivalent to the area round each bed; " —it is one of the great mistakes of the present day. Supposing a ward calculated to contain in ordinary times 30 general patients, the dimensions of " which ward might be 135 feet long, 30 feet wide, and 16 feet high, and in which " ward the distance between beds would be 18 feet from foot to foot, and 6 feet " from side to side, the cubical contents would be 2,160 feet per bed. By " reducing the number of beds down to 18, I should make a fever ward with a " distance between its beds of 18 feet from foot to foot, and 15 feet from side " to side, giving cubical space of 3,600 feet to each patient; a space which " I should think quite adequate to any emergency. By carefully excluding " at such times all chest affections from these wards you would be enabled " to allow a much larger volume of fresh air, so essential in the treatment " of fever and all infectious diseases, but which would be prejudicial to pulmonary complaints."—J.S.

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of surgical injury and operation.* It must not, I think, be ignored, that here, unless extraordinary precautions be taken, the patients incur an increased liability to the rise and spread of traumatic infections. For the difficulty of providing adequate ventilation for a given surgical case varies with the nature of the case,—the generation of foul products being in some cases no more than in health, while in other cases it is enormously large; and a ward, which could be adequately ventilated if it contained a fair admixture of these two classes of cases, may have an entirely unmanageable intensity of traumatic atmosphere if only the latter class of cases be received into it. Such a ward is, in every practical sense of the word, overcrowded; and the consequences of surgical overcrowding will arise in it.

I wish that it were in my power to complete my consideration of these subjects by comparing together on a large scale, in relation to them, the different hospital experiences of the United Kingdom. Evidently with the present materials no such comparisons can be made.† Not even *results* for comparison are forthcoming. And what value would there be in comparing results unless also *difficulties* could be compared? That a given hospital has not had in it any spread of contagious disease, or that it has not originated any cases of traumatic infection, does not necessarily imply any sanitary

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* Adverting to the remarks made in a previous footnote on the experience of the hospital-ship "Dreadnought," I would here suggest that, where the practice is as above described, it might be well that, if practicable, every special ward should every year change the nature of its special duty.—J.S.

† At the time when the reporters made their visits, they found that cases of traumatic infection, originated within hospitals, were (in proportion to the number of surgical cases under treatment) nearly three times as numerous in London as in the country. But they give reasons for not considering this to be a true picture of the average state of things. They also point out that in London the number of cases of traumatic infection (29) which had arisen within the hospitals was greatly exceeded by the number of such cases (41) which had been admitted with the disease already existing;—whereas, in the country hospitals, the number of cases (13) which had come from outside was but small in comparison with the number (30) which had arisen within the hospitals. Further, on examining, so far as their very limited materials would permit, the proportions in which pyæmia had contributed to the respective totals of hospital death in town and country, they found, as I have detailed in a former footnote, that in the country hospitals deaths from pyæmia in proportion to the total number of hospital deaths had been twice as numerous as in the London hospitals.—J.S.

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merit in the hospital. Either fact may merely mean that the sanitary merits of the hospital have not been tested. And surely it is no matter for praise that a hospital escapes the difficulty of an intense traumatic atmosphere by the chance that its surgical practice is petty;—still less is it matter for praise, that the hospital evades the difficulty of contagion by ruling that no contagious fever shall receive medical assistance within its wards. The merit of a hospital is to conquer these difficulties, and to conquer them at their utmost. If the hospital be in a position where contagious diseases do not appeal for admission, and where but few severe surgical casualties and operations occur, then almost certainly it may be said that the hospital is not wanted where it stands. It is for other circumstances than these that my proposed test of hospital management is applicable,—the test, whether contagious disease is treated with the least possible spread of contagion, and whether surgical practice goes on with the least possible hindrance from outbreaks of traumatic infection. If a hospital cannot answer this test, doubtless it is but an imperfectly healthy hospital. But if, because of the hospital's position, or because of its rules, that test of healthiness is never applied, then, whatever may be thought of the healthiness, the usefulness of the hospital is but small. In short, it is here as it was with the general death-rates. There is but one fair and practical way of estimating hospital success. In all these discussions, and whether hospitals be compared with one another, or be judging themselves singly on their results, the word "success" is utterly delusive unless it means "success in proportion to endeavours." Where hospitals are doing exactly similar work, there a comparison of hospital results will be a comparison of hospital merits. But in any other case it must be mere playing with figures. And for me to attempt it on any large scale with such materials as I have before me would, I think, be indiscreet and wrong. Therefore I have confined myself to suggesting the principles on which, in my opinion, the working of any individual hospital may fairly be criticized by the hospital managers, and may, here and there, to a very limited extent, be compared with other standards.

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I particularly regret that my materials do not allow me to submit any exact positive conclusions on the influence of SITE as an element of hospital salubrity,—especially as regards the broad difference between town and country. But obviously there is only negative evidence on this subject,—evidence, that such differences of site as came under the reporters' consideration were not of appreciable effect in the presence of those large other differences which universally were concurrent with them, and by which all influence of theirs (if such influence there was) must have been either out-weighed or exaggerated. As regards the relative advantages of town and country, this difficulty is strongly shown by one conclusion of the reporters:—"English rural hospitals have acquired, on " false grounds, a reputation for comparative healthiness;—by " their regulations, their practice, or their position, they receive " habitually a far less serious class of cases than is admitted " into the hospitals of London and other large towns;—this " difference in the quality of the practice is much greater in " respect of medicine than of surgery, but is considerable even " as regards surgery;—the result is, marked lowness of death- " rates, even (in many cases) in the presence of a high degree " of hospital insalubrity." Notwithstanding this difficulty, however, it may safely be assumed as certain, that, where there are *true* differences of salubrity between two different places,* hospitals at those places respectively will, cæteris

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* By the "true salubrity" of a place, I mean the salubrity of its *common* atmosphere, and other *common* influences,—its freedom, in respect of those influences, from all tendency to breed endemic disease. A district which itself is quite salubrious may have a fictitious appearance of insalubrity from the fact that many or most of the houses in it are ill-built and ill-kept, or because large sections of its population are of unhealthy personal habits or circumstances. But distinct from these sources of fallacy, there are also in this country some known true differences of salubrity. Thus,—to take first the extreme illustration, there are some districts which breed ague and the allied disorders. Again, there are the minor differences of salubrity which depend on differences of soil, especially where clay is compared with the soils which are least retentive of moisture. Again, subject to some qualifications, there are differences of salubrity dependent on differences of level. At present, also, between town and country, there probably are true differences of salubrity—differences, however, which do not all tell one way, as well as enormous fictitious differences of salubrity. On the one hand, the common atmosphere of country is much brighter than the common atmosphere of town, and is also comparatively

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paribus, have corresponding differences of success. But, waiving all consideration of the difficulties which at present there would be in any attempt to compare the true salubrity of districts, I must observe that the principle which I have stated admits of but very limited application. For primarily the site of every hospital must be decided by the site and distribution of the population to which it has to minister; and if, as too commonly happens, reasons of trading convenience or other reasons have determined a population to settle itself in a site of comparative insalubrity, the hospital which has to minister to that population can seldom do otherwise than to some extent share the same lot. All that it has then to do is to make the best settlement which is possible within the limited area of choice. But, even under these restrictions, the choice is not a matter of indifference. Perfect security ought to be sought for the drainability and water-

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unpolluted by animal effluvia and many other kinds of impurity; while, on the other hand, whatever morbific influences may come from the soil are likely to be less potent in town than in country,—and, indeed, it may have been thus that the marked preference of diphtheria for rural rather than urban districts arose and is to be accounted for. But all the above differences, except the first, are of almost imperceptible effect in this country, when compared with those local influences which are irrespective of true district-salubrity,—the influences, namely, which operate in detail, and consist in multiplied separate instances of sanitary mismanagement or misfortune. So overwhelming are these latter influences, that hitherto it has been practically impossible to get any true measure of the others. But constantly we have opportunities of observing that well-kept establishments maintain a very satisfactory healthiness in the midst of districts which popularly have the worst reputation for salubrity:—Bedlam, for instance, in the district of St. George's, Southwark, or model lodging-houses in various poor districts of London. Why St. George's, Southwark, has an exceedingly high death-rate, and why in our epidemics of Asiatic cholera it has suffered beyond most districts of London, is matter of sanitary record, on which I need not enter;—but Bedlam, having good sanitary arrangements for itself, takes no apparent share in the unhealthiness of the district in which it stands, and has never, during all our epidemics of cholera, had even a single cholera death within its walls. The Whitechapel district, in which the London Hospital stands, has a death-rate half as high again as the death-rate of St. George's, Hanover Square, and the death-rate of the West London District, where St. Bartholomew's Hospital stands, is almost equally high:—but differences like these have no necessary connexion with true differences of district-salubrity, and there is no reason whatever for supposing that, if either of those two hospitals could transfer its practice to the western district, the results of that practice would show any appreciable improvement of success.—J.S.

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supply of the future hospital. A clay soil ought, if possible, to be avoided. Also, where the hospital is for a town, sites must be compared with special regard to their respective degrees of spaciousness and ventilability ; and in order to get more of these advantages, so far as the pursuit of them consists with the due accessibility of the hospital, preference commonly ought to be given either to the outskirts or to the largest interior spaces of towns. Except for special reasons to the contrary, hill-tops are to be preferred to hill-slopes, and either of them greatly to valley-bottoms. And the cleaner the neighbourhood the better. But in this respect it may be proper to add, that, against the common nuisances which not infrequently exist in towns, and by which town hospitals may be aggrieved, the hospitals, like private individuals, can look to the law for protection and redress.

It would be foreign to my present purpose to discuss with any minuteness the vastly different degrees in which different hospitals endeavour to be useful to the public. But this is a matter which, in respect of many charities, eminently deserves further criticism. And therefore I would again invite attention to the statements which Dr. Bristowe and Mr. Holmes make with regard to the effect of certain regulations in restricting the usefulness of hospitals. Especially I must advert to the rules which prohibit the admission of cases of contagious fever, and in effect exclude most other acute diseases from the benefit of hospital treatment. It seems to me that in such rules there is implied the dereliction of a hospital's most important functions. I cannot conceive any cases having more claim to hospital treatment than those cases of typhoid, and sometimes typhus fever, which the rules would expressly and rigidly exclude. To leave such cases in the ill-provided homes of the poor is not only to withhold the assistance of the charity from persons in very urgent need of the best attainable medical treatment, but it further involves, as an almost necessary result, that the disease shall continue its ravages in the family, and perhaps greatly beyond the family, which it has attacked. Fifty years ago, adverting to

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this matter, Sir Gilbert Blane found it "difficult to conceive "what idea the authors of such a regulation could form of a "hospital as a beneficient institution, the end of which is "the alleviation of human misery;" and his language might have been stronger than it was, if he could have seen such evidence as we now have, of the indirect effect of that regulation in excluding other large classes of disease which quite pre-eminently claim hospital treatment. I am far from contending unconditionally that every existing hospital ought to receive cases of contagious fever; for, among those hospitals which the reporters describe, there are some where such fevers could not be treated in common with other diseases, without the certainty that their contagion would spread. But with reference to such hospitals I must submit, that they, while they cannot safely receive fever, are but fragments of that hospital accommodation which every populous place ought to have for its sick poor. Either they ought to be reformed, so that fever could properly be treated in them, or they ought to be superseded or supplemented by others. And if the wealth and charity of a neighbourhood are insufficient for the maintenance of such a general hospital as may receive all severe cases without distinction, then, I would suggest, the maintainers of the smaller charities might do well to consider whether, in their admission of patients, the present order of preference ought not to be absolutely reversed,—whether all other claims of disease ought not to be regarded as subordinate to the claims of contagious fever.

In a preceding passage of this report I have suggested that it is, for various reasons, incumbent on the managers of hospitals to cause such records to be kept as may show what work is done in each hospital, and what is the successfulness of the work. And now, in conclusion, I will venture to submit my opinion, that it would conduce very considerably to an improved administration of funds given for purposes of medical charity, if some department of the government were annually to collect all such records, and to publish from them information which would enable just comparisons to be made between

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the doings of different institutions, and the proportions which such doings bear to the requirements of the respective neighbourhoods. Indeed, not only with reference to the general hospitals to which my previous remarks have always referred, but with reference to all medical charities, it seems to me that something of that kind is greatly wanted. In saying this, I do not only refer to that very wholesome emulation and progress in the art of healing, which it would be the tendency of such a publication to develop among the different institutions of the country, but refer also and emphatically to a non-medical aspect of the question. At present, when the public is appealed to, as incessantly it is, to give money to this or that new undertaking for professed purposes of medical charity, it is almost wholly without means of judging how far the particular purposes are already accomplished. It has only *ex parte* statements before it. Nor can it well judge of the needs and merits of established charities, excepting by such statements as the directors of some charities put forth,—statements which for the most part are framed solely with the view of moving public sympathy, and which, in order to this object, are often highly coloured and partial. The want of something like method in matters of medical charity leads to an infinite waste of charitable resources, and doubtless this waste (after the manner of all wastes) implies privation in one place as against superfluity in others,—here an overlapping and duplication of well-intended charity, and there comparative bareness and destitution. A perfectly harmonious organization of these matters (such an organization as there is in Paris under the *Bureau de l'Assistance Publique*) is of course not to be expected under that system of voluntary co-operation which distinguishes the charities of this country. But at least an approximation to it might be made—and an approximation which would not involve the smallest sacrifice of any one institution's independence, if the public could have before it such authentic materials as I propose, for forming a judgment on the distribution and efficiency of all means of medical relief.

It would be essential to the usefulness of any such publication, that the records which it would purport to compare should be records kept on an uniform plan. And very important furtherance might, I think, be given to the general introduction of such a plan, if some of our leading hospital physicians and hospital surgeons would confer together as to the tabular forms which in their judgment might best serve to record all useful information, and would combine both to urge the adoption of such forms at their own respective hospitals, and also to recommend similar forms to other hospital officers throughout the country.

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From the Seventh Report to the Privy Council, 1864.

[The Seventh Report comprises:—A brief reference to the continued superintendence of Public Vaccination, which is omitted from the reprint, *vide* Vol. I. p. 364; a section on the Distribution of Disease in England devoted specially to (i.) House Accommodation; (ii.) the working of the Nuisances Removal Acts; (iii.) the Parasitic Diseases in Animals used for Food.

Then follows an account of the miscellaneous proceedings of the year 1864.—1. Inquiry into the extraordinary large proportion of deaths which pulmonary phthisis was apparently causing in the south-western counties of Wales: an excess which Dr. Hunter showed to be due to the fact that a large proportion of the deaths were not medically certified, and that among the non-medically certified deaths the term consumption was commonly used in a multitude of senses. 2, 3. Inspections, also undertaken by Dr. Hunter, at Congleton, as to the industrial circumstances which develop excesses of lung disease, and at Crickhowell into the causes of the high general death-rates. 4–12. Nine local inquiries into the local dependence of typhoid fever upon sanitary defects principally of drainage and water-supply. 13. An inquiry respecting typhus fever at Liverpool by Dr. Buchanan, shewing all facts and circumstances of the epidemic, and describing the action taken by the local authorities with a view to limit the spread of the disease, and to provide treatment for sufferers. 14. An inquiry at Woolwich, by Dr. Bristowe, into an alarming prevalence of enteric fever.

The Section of the report relating to the Distribution of Disease in England is here reproduced.—Ed.]

DISTRIBUTION OF DISEASE IN ENGLAND, AND THE CIRCUMSTANCES BY WHICH IT IS REGULATED—*cont.*

1. *House Accommodation.*

In further pursuit of an object which had been proposed in 1863, and towards the attainment of which one important

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House accommodation of rural laborers.

step had in that year been made by their Lordships' very extensive inquiry as to the food of the poorer laboring classes,—in further pursuit, namely, of the object of ascertaining with what degree of sufficiency the primary wants of the body are satisfied among the poorer classes of the population,—my Lords during 1864 caused to be made throughout England an inquiry as to the house-accommodation had by the agricultural and other laborers of rural districts. The inspector employed on this important inquiry was Dr. Hunter. He, in making it, examined in the different counties of England as many as 5,375 occupied houses, and investigated, in each place that he visited, what local circumstances were in operation to affect the quality of the dwellings of the poor.

As I observed last year with regard to their Lordships' Food-inquiry, so with regard to the present Dwellings-inquiry I may observe, that it does not pretend to be exhaustive; that for obvious reasons it could but be an examination of *samples;* and that the trustworthiness of its results depends entirely on the degree of success which has been attained in finding samples which are fairly representative. It may be that perfect success in that respect has not invariably been attained,—that sometimes the good in a place has not fully come to light, and sometimes not fully the bad. But having regard to the dimensions of the inquiry, and to the precautions with which it was conducted, I feel assured that its general results must be true for very large masses of population.

Dr. Hunter's report is subjoined in extenso [A]. It seems to me to deserve in two respects very particular consideration:—first, as regards the evidence which it gives on the matter to which it primarily relates; and, secondly, as regards the information which it incidentally contains on the working of the Nuisances Removal Acts in the rural districts of England.

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To the insufficient quantity and miserable quality of the house-accommodation generally had by our agricultural laborers, almost every page of Dr. Hunter's report bears

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testimony. And gradually for many years past the state of the laborer in these respects has been deteriorating,—house-room being now greatly more difficult for him to find, and, when found, greatly less suitable to his needs, than perhaps for centuries has been the case. Especially within the last twenty or thirty years the evil has been in very rapid increase, and the household circumstances of the laborer are now in the highest degree deplorable. Except in so far as they whom his labor enriches see fit to treat him with a kind of pitiful indulgence, he is quite peculiarly helpless in the matter. Whether he shall find house-room on the land which he contributes to till, whether the house-room which he gets shall be human or swinish, whether he shall have the little space of garden that so vastly lessens the pressure of his poverty,—all this does not depend on his willingness and ability to pay reasonable rent for the decent accommodation he requires, but depends on the use which others may see fit to make of their "right to do as they will with their own." However large may be a farm, there is no law that a certain proportion of laborers' dwellings (much less of decent dwellings) shall be upon it; nor does any law reserve for the laborer ever so little right in that soil to which his industry is as needful as sun and rain. Yet were this the whole hardship, his case would be less desperate than it is. For they who arbitrate the comfort or discomfort of his lot might then at least have found a small balance of advantage to themselves in having him resident on his place of work; while, as regards the bit of garden which would be almost wealth to him, and for which he would cheerfully pay the outside rent which it is worth, his money would have been as good as another man's. But an extraneous element weights the balance heavily against him, and he loses those fair chances of free trade. The element to which I refer is the influence of the Poor-Law in its provisions concerning settlement and chargeability. Under this influence, each parish has a pecuniary interest in reducing to a minimum the number of its resident laborers: for, unhappily, agricultural labor, instead of implying a safe and permanent

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independence for the hard-working laborer and his family, implies for the most part only a longer or shorter circuit to eventual pauperism,—a pauperism which during the whole circuit is so near, that any illness or temporary failure of occupation necessitates immediate recourse to parochial relief; and thus all residence of agricultural population in a parish is glaringly an addition to its poor-rates. In parishes where property is much subdivided, this relation between poor-rates and resident laborers may be but indistinctly felt, or, however much felt, would be recognized as an infliction which cannot easily be evaded. But large proprietors feel the burthen very definitely and considerably, and, while feeling it, cannot but know that they have facilities, which are deemed not to be illegal, for shifting it away from themselves. They have but to resolve that there shall be no laborers' dwellings on their estates, and their estates will thenceforth be virtually free from half their responsibility for the poor. How far it has been intended in the English constitution and law that this kind of unconditional property in land should be acquirable, and that a landlord, "doing as he wills with his own," should be able to treat the cultivators of the soil as aliens whom he may expel from his territory, is a question which I do not pretend to discuss. But I think it all important that the working of this system, as exhibited in Dr. Hunter's report, should be clearly seen by those who can judge it in its legal, as well as in its moral, relations. For that power of eviction which I have described does not exist only in theory. On a very large scale it prevails in practice,—prevails no doubt under a variety of motives, but chiefly under that pecuniary one which the Poor Law everywhere supplies,—prevails as a main governing condition in the household circumstances of agricultural labor. What, in different cases, are the relative magnitudes of hardship will be best seen in the details of Dr. Hunter's report; but, as regards the extent of the evil, it may suffice to advert to the evidence which Dr. Hunter has compiled from the last Census, that destruction of houses, *notwithstanding increased local demands for them*, had, during the last ten years been in

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progress in 821* separate parishes or townships of England;—so that, irrespectively of persons who had been forced to become non-resident, these parishes and townships were receiving in 1861, as compared with 1851, a population $5\frac{1}{3}$ per cent. greater into house-room $4\frac{1}{2}$ per cent. less. And it is scarcely needful to observe that, besides these 821* extreme cases, where houses of a parish were pulled down in the teeth of an increasing population, there were also innumerable parishes where the demolition of houses was going on more rapidly than any lessening of the population could explain. When the process of depopulation has completed itself, the result (says Dr. Hunter) is a show village, " where " the cottages have been reduced to a few, and where none but " persons who are needed, as shepherds, gardeners, or game-" keepers, are allowed to live;" . . . regular servants, who " receive the good treatment usual to their class. But the land " requires cultivation, and it will be found that the laborers " employed upon it are not the tenants of the owner, but that " they come from a neighbouring *open* village, perhaps three " miles off, where a numerous small proprietary had received " them when their cottages were destroyed in the *close* villages " around." Where things are tending to the above result, often the cottages which stand testify, in their unrepaired and wretched condition, to the extinction to which they are doomed. They are seen standing in the various stages of natural decay. While the shelter holds together, the laborer is permitted to rent it; and glad enough he will often be to do so, even at the price of decent lodging. But no repair, no improvement shall it receive, except such as its penniless occupants can supply. And when at last it becomes quite uninhabitable—uninhabitable even according to the humblest standard of serfdom, it will be but one more destroyed cottage, and future poor-rates will be somewhat lightened.

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* In Dr. Hunter's list there are 11 cases, where the word "parish" is applied not to a true parish or township, but to some lesser area, which, for local reasons, has been separately named in the Census, and where, in the remainder of the true parish, the relation of house-room to population has not been that which the heading of Dr. Hunter's table describes.—J.S.

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While great owners are thus escaping from poor-rates through the depopulation of the lands over which they have control, the nearest town or *open* village receives the evicted laborers:—the nearest, I say; but this "nearest" may be three or four miles distant from the farm where the laborer has his daily toil. To that daily toil there will then have to be added, as though it were nothing, the daily need of walking six or eight miles for power of earning his bread. And whatever farm-work is done by his wife and children is done at the same disadvantage. Nor is this nearly all the evil which the distance occasions him.

In the open village, cottage-speculators buy scraps of land which they throng as densely as they can with the cheapest of all possible hovels. And into these wretched habitations (which, even if they adjoin the open country, have some of the worst features of the worst town residences) crowd the agricultural laborers of England. To show what a mockery of accommodation is likely to be the laborer's lot in the town or open village to which he is driven, I might content myself with referring to almost any page of Dr. Hunter's report; and if I here particularly call attention to what he writes about Wrestlingworth and Dunton in Bedfordshire, Beenham in Berkshire, Winslow in Buckinghamshire, Gamblingay in Cambridgeshire, Hallingbury in Essex, Madley in Herefordshire, Hartford in Huntingdonshire, Langtoft in Lincolnshire, Lubenham in Leicestershire, Dymock in Gloucestershire, Basingstoke in Hampshire, Floore in Northamptonshire, Stratton in Wiltshire, and Badsey in Worcestershire, I do so merely for the reader's convenience, and not with any suspicion that these cases are exaggerative illustrations of their class.

It would, however, be unjust to suppose that the relations between the large landowner and the laboring population are universally such as I have described. Dr. Hunter's report shows many illustrations of landownership exercised in a far different spirit. There are some of the very largest land-properties in the country, where for generations there has been the tradition of a better treatment; where at least no aggression has been made against the house-accommodation

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of the poor; where only very low rents are taken; where gardens are commonly given; where deep wells have been sunk; where at least roofs and walls have been kept in sufficient repair; and where, while the landlord has done these things, the tenants, knowing themselves to be secure against eviction, and hoping that their children may succeed to their homesteads, have been encouraged to plant their gardens, to protect their houses against dilapidation, and even to improve the property by occasional necessary outbuildings. Among such estates I may name, as of conspicuous magnitude, the properties of the Dukes of Bedford, Rutland, and Newcastle, and of the Marquis of Exeter. But by instances like those, judgment must not be blinded to the fact that they, in proportion to the mass of observed cases, are altogether exceptional and rare, and that, while our Poor Law continues unaltered in its provisions concerning settlement and chargeability, such instances must tend to become still rarer and more exceptional. For, practically, any future may be foretold from the known interests of those who can control it; and it would be too much to expect that landowners as a class should be the voluntary bearers of a taxation, which the law leaves them option to escape.

Nor on the other hand must it be supposed that, even when the laborer is housed upon the lands which he cultivates, his household circumstances are generally such as his life of productive industry would seem to deserve. Even on such princely estates as those which I have above named, his cottage, though secure to him, may be of the meanest description. In other cases the accommodation which he rents from his employer is often atrociously bad, and at the same time exorbitantly dear. There are landlords who deem any stye good enough for their laborer and his family, and who yet do not disdain to drive with him the hardest possible bargain for rent. It may be but a ruinous one-bedroomed hut, having no fire-grate, no privy, no opening window, no water-supply but the ditch, no garden,—but the laborer is helpless against the wrong. Even the base principle of *caveat emptor* is inapplicable, where a prime necessary of life is

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concerned, and no alternative purchase can be made. And the Nuisances Removal Acts to which he might have wistfully looked for protection against some evil conditions of dwelling, are probably (as will hereafter be seen) a mere dead letter in the district—perhaps in great part dependent for their working on such cottage-owners as the one from whom his hovel is rented.

Here, however, it is again right to observe, that the evil is not universally found. In contrast with the last-drawn picture of a far too frequent phenomenon, many parts of England show the pleasant spectacle of landowners taking real interest in the quality of such cottage-accommodation as they choose to have existing on their estates. Often such landlords have begun the reconstruction of their cottage-property on a scale better suited than the old models to the requirements of an English laboring family. For instances of such re-construction, more or less advanced, I may refer to those parts of Dr. Hunter's report which speak of Lord Londesborough's estates in the East Riding of Yorkshire, Mr. Gurney's in Norfolk, Mr. Palmer's and Mr. Walter's in Berkshire, Mr. Knight's in Kent, and Lord Middleton's in Yorkshire and elsewhere. Dr. Hunter suggests that in some of the above instances the attempt has been made on a scale of even dangerous liberality,—dangerous, because the cost of each such cottage is so great that sufficient numbers of cottages are not likely soon to be built,—dangerous again, because the cottages are of such size and excellence that they are likely to be much desired by well-off classes of the community, and may thus eventually be lost to those for whose occupation they have been built. In other cases the owners have adopted a much cheaper, and under favourable circumstances not less effectual, system of converting rows of decayed cottages, or useless malt-houses, or other farm-buildings, or, here and there, an obsolete parish workhouse, into sets of comfortable cottages, which—as was illustrated in Bucklebury in Berkshire, at Witley in Surrey, and especially on Lord Palmerston's estate near Romsey, may be let at remarkably easy rents.

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From these brighter but exceptional scenes, it is requisite in the interests of justice that attention should again be drawn to the overwhelming preponderance of facts which are a reproach to the civilisation of England. Lamentable indeed must be the case, when, notwithstanding all that is evident with regard to the quality of the present accommodation, it is the common conclusion of competent observers, that even the general badness of dwellings is an evil infinitely less urgent than their mere numerical insufficiency. For years, the overcrowding of rural laborers' dwellings has been a matter of deep concern, not only to persons who care for sanitary good, but to persons who care for decent and moral life. For, again and again, in phrases so uniform that they seem stereotyped, reporters on the spread of epidemic disease in rural districts have insisted on the extreme importance of that overcrowding, as an influence which renders it a quite hopeless task to attempt the limiting of any infection which is introduced. And again and again it has been pointed out, that, notwithstanding the many salubrious influences which there are in country life, the crowding which so favours the extension of contagious disease also favours the origination of disease which is not contagious. Those, too, who have denounced the overcrowded state of our rural population have not been silent as to a farther mischief. Even where their primary concern has been only with the injury to health, often almost perforce they have referred to other relations of the subject. In showing how frequently it happens that adult persons of both sexes, married and unmarried, are huddled together in single small sleeping-rooms, their reports have carried the conviction that, under the circumstances they describe, decency must always be outraged, and morality almost of necessity suffer. Thus, for instance, in the Appendix of my last annual Report Dr. Ord, reporting on an outbreak of fever at Wing in Buckinghamshire, mentions how a young man who had come thither from Wingrave with fever, "in the first days of his illness slept " in a room with nine other persons. Within a fortnight " several of these persons were attacked, and in the course

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" of a few weeks five out of the nine had fever, and one died." And to this passage I appended the following foot note :— " From Dr. Harvey of St. George's Hospital, who on private " professional business visited Wing during the time of the " epidemic, I received information exactly in the sense of the " above report. Two cases of overcrowding which Dr. Harvey " observed were the following. A young woman of 19 having " fever, lay in a room occupied at night by her father and " mother, her bastard child, two young men (her brothers) and " her two sisters, each with a bastard child, 10 persons in all. " A few weeks ago 13 persons slept in it. In a second house, in " the downstairs room (whither they had been moved at the " doctor's orders from the bed-room where seven persons ordi- " narily slept) lay in one bed two young men, and in the other " bed the sister with her bastard baby. The lads and women " all had fever." Dr. Hunter's report gives innumerable cases of that sort of overcrowding as consequent on the paucity and smallness of dwellings. Doubtless, in some instances, the evil is aggravated by the influence of local industries—straw-plaiting, glove-making, braiding, shoe-making, &c., which are followed as household occupations by young women who otherwise might be in service or married away from home: but, though this influence may occur in aggravation, the main cause of the overcrowding is that which has already been discussed. It is true that neither the provisions of the Common Lodging Houses Act, nor the provisions as to overcrowding contained in the Nuisances Removal Act, are all which could be desired for efficiency in the matters to which they respectively relate: but, apart from their technical insufficiency, and apart from the evident unwillingness which there is to apply them in country districts, it is certain that, while rural house-accommodation is on its present scale, not any statute could easily prevent the evils against which those provisions are directed. Here, as with regard to other main facts of the case, I may cite almost any part of Dr. Hunter's report; but, for perhaps the most general prevalence of the evil, I may refer to his account of the counties of Bedford, Buckingham, Warwick, Oxford, Worcester and Northampton.

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By what enactments or other influences it may be practicable to amend the state of things which I describe from Dr. Hunter's report of the facts is perhaps one of the most difficult problems in our present social economy. And while I feel that it would be irrelevant to the main object of this Report to enter upon the many and various considerations which that question involves, I also very deeply feel that, in an extreme degree and peculiar manner, it requires the wisdom of Parliament for its solution. Only most briefly and tentatively, therefore, would I suggest the direction in which it seems to me that the remedy has to be sought. First (and here I speak more positively than on any part of the subject) it seems indispensable that the Poor Law should no longer offer its present strong inducements for the dislodgement of agricultural laborers from places where their industry is employed. If the Union Chargeability Bill now before Parliament becomes law, those inducements will be in great part removed; and it may fairly be expected that, in prevention of further mischief, the results of the amendment will be very considerable. But if not absolutely necessary in order to arrest the mischief which is now in progress, at least to undo that which has been done, I suspect that more than the one amendment will be wanted. And the ulterior question which will, I think, have to be considered is this,—whether all land which requires labor ought not to be held liable to the obligation of containing a certain proportion of suitable laborers' dwellings. A literal enforcement of that obligation might not indeed always be practicable or expedient. But if the principle of action were understood to be that which I have expressed, means (which need not here be discussed) would soon be found for fairly approximating to it n practice.

Other laborers.

The present inquiry concerning the house-accommodation had by the laboring classes of rural districts having been designed by the Lords of the Council to show the facts of the case, not exclusively with regard to the class employed in agriculture, but generally with regard to all classes of rural

Other laborers. laborers, therefore the household-circumstances of mining and colliery populations fell within its scope, as did also the circumstances of that large class of rural population which follows the more migratory kinds of labor. Among these various non-agricultural sections of the rural population, are reached apparently the lowest levels at which a so-called house-accommodation exists.

Miners. In the mining and colliery districts, it is frequent that large populations are gathered together with scarcely more ædile organization than if the people were but to be tented there for a night. "The extreme badness," says Dr. Hunter, with reference to the northern coal-districts, "is in the high number " of men found in one room; in the smallness of the ground-" plot on which a great number of houses are thrust; in the " want of water; in the absence of privies, and in the frequent " placing of one house on the top of another, or distribution " into flats,—a form utterly unfit for working men, and only " justified by the high price of land in large cities." And often the largeness of the local population gives to this case a peculiarity and intensity of evil which cannot be matched, nor easily be approached, in purely agricultural districts. Compendious illustrations to this effect may be seen on referring to Dr. Hunter's account of Risca in Monmouthshire, of Calstock in Cornwall, of Lower Prudhoe in Northumberland, or to Dr. Stevens's independent description of the sanitary circumstances which he found prevailing at the colliery-settlements of Gilesgate Moor [A]; but the magnitude of the evil will not be appreciated, unless it be observed how very frequently that state of things, with only slight shadings of difference, was found by Dr. Hunter in the many districts which he visited of Durham, Northumberland, and Monmouthshire.* The frequent utter absence of exterior conditions of comfort and decency is the more striking, when it is contrasted with those signs of regard for order and cleanliness which, in the northern districts, are to be seen in the interior of a collier's dwelling.

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* In Derbyshire generally, the circumstances are far better than in the above-mentioned counties; but the case of Whittington, in Derbyshire, may be referred to as sadly illustrative of the sufferings which are entailed on these populations by the absence of proper arrangements for water-supply.—J.S.

Miners.

In apology for the very wretched household-accommodation with which these populations so frequently exist, it is alleged that mines are commonly worked on lease; that the duration of the lessee's interest (which in collieries is commonly for 21 years) is not so long that he should deem it worth his while to create good accommodation for his laborers, and for the trades-people and others whom the work attracts; that, even if he were disposed to proceed liberally in the matter, this disposition would commonly be defeated by his landlord's tendency to fix on him, as ground-rent, an exorbitant additional charge for the privilege of having on the surface of the ground the decent and comfortable village which the laborers of the subterranean property ought to inhabit; and that this prohibitory price (if not actual prohibition) equally excludes others who might desire to build. It would be foreign to the purpose of this report to enter upon any discussion of the merits of the above apology. Nor here is it even needful to consider where it would be that, if decent accommodation were provided, the cost of providing that accommodation would eventually fall,—whether on landlord, or lessee, or laborer, or public. But in presence of such shameful facts as are vouched for in the annexed reports, a remedy may well be claimed. Wherever may be the eventual incidence of the cost of the better accommodation, clearly it is of public concern that the better accommodation should be given. In principle there seems little real difference between the present case and the case (which I before discussed) of the dislodged agricultural laborers. Claims of landlordship are being so used as to do great public wrong. The landlord in his capacity of mine-owner invites an industrial colony to labor on his estate, and then in his capacity of surface-owner makes it impossible that the laborers whom he collects should find proper lodging where they must live. The lessee meanwhile has no pecuniary motive for resisting that division of the bargain;—well knowing that if its latter conditions be exorbitant, the consequences fall not on him, that his laborers

Miners.

on whom they fall have not education enough to know the value of their sanitary rights, that neither obscenest lodging nor foulest drinking water will be appreciable inducements towards a "strike." Accordingly, for remedying the present state of things, the great desideratum is, that no mine-owner should be able to dissociate from one another the two capacities of his landlordship. It may be that this object would for practical purposes be better attained by indirect than by direct legislation; and that, indeed, the former might be made to guard against some wrongs which the latter would probably let escape. That powers akin to those which Local Boards exercise under the 34th section of the Local Government Act with regard to new buildings should be exerciseable in mining districts by whatever local authority administers the Nuisances Removal Acts,—this, if the local authorities so willed, would render impossible any reproduction of the present evils. And it is scarcely needful to say that meanwhile, if the Nuisances Removal and Common Lodging Houses Acts were properly administered in the mining districts, or, still more, if those statutes were first amended in some particulars where they seem but imperfectly to fulfil the intentions with which the Legislature enacted them, no such scenes could exist as the inspectors describe, of filth, unwholesomeness, and indecency. That mining settlements need not to be the foul, priviless, ill-watered, unscavenged, overcrowded lairs which the inspectors so often found them to be, is shown by Seaton Colliery in the North, by the Duke of Newcastle's at Shireoaks in Notts, by Mr. Cossham's at Pucklechurch, Gloucestershire, and by Mr. Barrow's at Staveley, Derbyshire.

Roving outdoor laborers.

As regards the house-accommodation had in country districts by those classes of population which are engaged in migratory labor—as in various building operations, in draining, in the making of bricks, drain-pipes and tiles, in lime-burning, stone-getting, harvesting, &c., no common description can apply. For the lodging which such laborers obtain varies with the customs and circumstances of their labor,—partly according to its longer or shorter duration in any one place, partly according to the degree in which it is organized

Roving outdoor laborers.

under one common command, and so forth. Thus, there are ganging field-laborers—harvesters and the like, who, at their seasons of migratory labor, spend their nights, each one as he best can, sometimes in the open air, sometimes under any farm-shed which will give them shelter, and perhaps but exceptionally in anything that can be termed a house. In a different class of cases again—cases where the industry represents considerable capital, sometimes the undertaker of the work (for instance, the contractor of a piece of railway) provides wooden or other hutting for his men;—creating an extemporaneous village, which is sure to be without constructional appliances for keeping itself wholesome, and is apt to be singularly little cared for in that respect by the local authority of the district in which it stands. In other cases the immigrant laborers get themselves shelter among the permanent population of the place,—sometimes perhaps finding in common lodging houses or elsewhere a little space fairly available for their reception, but far oftener wedging themselves into the already overcrowded dwellings of the poorest section of the population. Whether this be the case, or that they be hutted under auspices of their employer, either way, as a rule, the accommodation will be of the vilest description, and will imply nuisances which endanger the public health. The parts of Dr. Hunter's report which relate to Anthony in Cornwall, Bentley and Market Weighton in Yorkshire, and Thrapston in Northamptonshire, illustrate the household circumstances of migratory labor by instances which probably are not extreme. With the nuisances which immigrant labor commonly implies, sometimes there will be this further serious complication,—that, amid the adventitious throng of population, there is imported some contagious disease under circumstances which peculiarly favour its spread; and severe local epidemics of small-pox, diphtheria, typhoid fever, cholera, typhus, scarlatina, have again and again owed their rise to such contagion from unclean industrial settlements.* Against

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* In illustration of the kind of danger to which my text refers, I quote here two letters of complaint which reached the Lords of the Council in Sept. 1864.—J.S.

(1.) One, addressed to Secretary Sir George Grey by the Chairman of the Nuisances Removal Committee of the parish of Sevenoaks, stated as follows:—" Small-pox cases were rarely heard of in this parish until about twelve months

Roving out-door laborers.

evils like the above—evils which almost invariably tend to co-exist with temporary immigrations of labor,—it is in the

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" ago. Shortly before that time the works for a railway from Lewisham to " Tunbridge were commenced here, and in addition to the principal works being " in the immediate neighbourhood of this town, here was also established the " depôt for the whole of the works, so that a large number of persons was of " necessity employed here. As cottage accommodation could not be obtained " for them all, huts were built in several places along the line of the works by " the contractor, Mr. Jay, for their especial occupation. These huts possessed " no ventilation nor drainage, and, besides, were necessarily overcrowded, " because each occupant had to accommodate lodgers, whatever the number in " his own family might be, although there were only two rooms to each tenement. " The consequences were, according to the medical report we received, that in " the night-time these poor people were compelled to endure all the horror of " suffocation to avoid the pestiferous smells arising from the filthy stagnant water, " and the privies close under their windows. Complaints were at length made " to the Nuisances Removal Committee by a medical gentleman who had occasion " to frequent these huts, and he spoke of their condition as dwellings in the most " severe terms, and he expressed his fears that some very serious consequences " might ensue unless some sanitary measures were adopted. About a year ago " Mr. Jay promised to appropriate a hut to which persons in his employ, who " were suffering from contagious disease, might be at once removed. He repeated " that promise on the 23rd July last, but although since the date of the last " promise there have been several cases of small-pox in his huts, and two deaths " from the same disease, yet he has taken no steps whatever to carry out his " promise. On the 9th September instant, Mr. Kelson, surgeon, reported to me " further cases of small-pox in the same huts, and he described their condition as " most disgraceful. I should add for your information that an isolated house " called the Pest-house, which is set apart for parishioners who might be suffer-" ing from infectious diseases, has been continually occupied by such patients " for many months past, and is also now occupied; that in one family five " children died from small-pox and fever; that from the 1st April to the " 1st September this year, a period of five months, there have been no fewer " than ten deaths from small-pox in the parish, four of them being in the huts " already referred to; that it is impossible to ascertain the exact number of " persons who have suffered from that disease, although they are known to be " many, from the fact of the families keeping it as private as possible; and that " diseased persons have been walking about the town in the daytime with the " marks of the disease full out upon them."—J.S.

(2.) In the other case the Relieving Officer of the Chapel-en-le-Frith Union wrote to the Registrar-General as follows:—" As Relieving Officer of the Chapel-" en-le-Frith Union, I beg to report to you that at Doveholes, in the township " of Fairfield in the said union, a number of small excavations have been made " into a large hillock of lime ashes (the refuse of lime kilns), and which are " used as dwellings, and occupied by labourers and others employed in the " construction of a railway now in course of construction through that neigh-" bourhood. The excavations are small, and damp, and have no drains or " privies about them, and not the slightest means of ventilation except up a " hole pulled through the top, and used for a chimney. In consequence of this " defect small-pox has been raging for some time, and some deaths have been " caused by them."—J.S.

highest degree important that local authorities should use full vigilance, and that their hands should be strong enough for the task. And, therefore, in few points of view can it be more important than here to note the evidence which Dr. Hunter's report incidentally contains on the subject of the administration of the Nuisances Removal Acts in the many rural districts which he visited.

Roving outdoor laborers.

2. *The Working of the Nuisances Removal Acts.*

Working of the Nuisances Removal Acts.

In order to a just appreciation of the evidence which the report contains, with regard to the administration of the Nuisances Removal Acts in the places which Dr. Hunter visited, it is essential to remember that an inquiry into the working of those Acts was not a primary object of his inspection. The fact is obvious in his report that very often, where he went, overcrowding was not the only removable cause of disease which he found to be in full local operation. Very often there were other nuisances, and sometimes the magnitude of nuisance was very great. But notes on this subject occur only as it were by accident in his report, and evidently relate only to cases where nuisances forced themselves upon his view in immediate connexion with the main matter of his enquiry. Regard being had to this circumstance, a very high importance must, I think, be understood to belong to the comparative frequency with which he describes conditions of neglected filth; and at any rate the cases are many enough to suggest very strong suspicions, that, with regard even to the most rudimentary and best-understood matters of hygienic police, our law, as it now stands, is far from sufficing for public protection. In this unsatisfactory sense they are supported and rendered conclusive by other evidence which during the last few years has been accumulating before the Lords of the Council; by definite local complaints which have been addressed to their Lordships; by reports of inspectors who have been sent to inquire into outbreaks of disease; and by the very abundant, though not detailed, notes on the subject, which have been made by the inspectors

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of public vaccination in the course of their peregrinations of all parts of England. In the reports and notes to which I advert, is to be found overwhelming proof that our present law is insufficient for its understood purpose. The most various accumulations of animal filth in closest proximity to dwellings, entire absence of drainage, or drains inoperative and stinking, ponds and ditches equivalent to open cesspools, drinking-water polluted and made poisonous with refuse,—such are the evils which (in addition to the unwholesomeness and overcrowding of the dwellings themselves) have constantly been coming under notice of the Lords of the Council, as conditions which local authorities are doing nothing, or nothing adequate, to remove. And, side by side with these conditions, uniformly has been seen the condemnatory, but characteristic, result of their presence,—the result, namely, that among the populations subjected to them, and in due proportion to their prevalence, human life has been overtaxed by those pestilential fevers and fluxes which may most distinctively be named the Filth-Diseases of our climate.

Occasionally, where such has been the state of things, something by way of apology could be advanced. The Nuisances Removal Acts, it must be allowed, are not fully adequate to their purpose; and, in some instances, a local authority accused of non-feasance has been able to allege in excuse that it had been hindered by imperfections of the law. Even the provisions which regulate the constitution of the authority have not universally been found unambiguous.* So again, as regards the essential officer of the authority—the (quocunque nomine) *inspector* for the purposes of the Acts,—doubts have arisen, whether the "inspector of "nuisances" of the Act of 1860 is invested with all the functional attributes of the "sanitary inspector" of the Act of 1855. Above all, the provisions for defrayment of expenses have in several cases been deemed obscure or inapplicable. Especially where works of any magnitude (such, for instance, as sewers) have been necessary, often larger financial powers have been wanted than those which the Nuisances Removal

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* See case of Seacroft [A] as the common case of all Gilbert Unions.—J.S.

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Acts confer; and, in view of this difficulty, the Poor Law Board has deemed it expedient that Boards of Guardians (who, in an immense majority of places are the authority for administering the Acts) should not undertake any such structural works, however needful they may be for the health of the place, but should rather leave open way to an adoption of the Local Government Act.* And it has been recognized as a very serious defect in the Acts, that the authority has no power, however great may be the need, to provide for the digging of a well.† Moreover, as I have above mentioned, neither by the Nuisances Removal Acts, nor by the Common Lodging Houses Act, is very effectual provision made against the overcrowding of houses.

Often, on the other hand, so far as could be judged from known facts, the inaction of local authorities has been an absolutely inexcusable neglect of duty. Generally it has been so at least in part; for, of the innumerable cases in which there has been pestiferous accumulation of filth about houses, very few can have been those where the local authority, if it had been so minded, might not have abated the nuisance. But this has not been the limit of the wrong. Sometimes statements have been made that the local authority has virtually entered into a collusion against the law which it had undertaken to administer, — that Nuisances Removal Committees have continued in office in order to prevent nuisances from being removed,—that inspectors of nuisances have been appointed on terms that implied a minimum of inspection to be required of them,—and so forth. And as confirmatory of such statements, it certainly deserves notice that some of the worst instances of neglect which have come under observation of the department have been cases where the appointed administrators of the law had kept its word of promise to the ear,—cases where committees and inspectors nominally existed, or even where the ample powers of the Local Government Act had been accepted by the authority.

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* See Glen's Law of Public Health, pp. 508.—J.S.

† See, for instance, in my last report, the circumstances under which the village of Wing could not look to its authority for the provision of a proper public well.—J.S.

Working of the Nuisances Removal Acts.

Under the above circumstances, it seems necessary that the extensive inoperativeness of the Nuisances Removal Acts should receive the attention of the Legislature. And in this point of view it may be desirable that I should here submit for consideration certain changes by which in my opinion these Acts, and other Acts which are of kindred purpose with them, might best be converted into laws which would be effectual for the public safety.

In the first place, of course, all ambiguities as to the constitution of local authorities, and as to the duties of officers, and as to the defrayment of expenses, would need to be cleared up.

Next, with regard to certain prime sanitary objects—objects which never ought to be unattainable in any place where population may gather at all densely,—I would suggest that every local authority administering the Nuisances Removal Law should have exactly the same powers as are exercised by Local Boards under the Local Government Act. The powers which in my opinion ought to be thus equally held by all authorities acting for sanitary purposes are those powers (financial and other) whereby Local Boards are enabled to provide for and enforce wholesome cleanliness within their districts,—especially such powers as the Local Government Act confers for purposes of sewering, draining and water-supply, and of public scavenging and cleansing, and of removal of house-refuse and other filth. And with this extension of the powers of common local authorities, it would in my opinion be desirable that the definition of the word "nuisance" in the Nuisances Removal Acts should be so extended as to cover the case of a district which is left without proper constructions and arrangements for wholesome cleanliness.

Thirdly, with regard to these elementary necessities of health, I venture to submit that the time has now arrived when it ought not any longer to be discretional in a place, whether the place shall be kept filthily or not. Powers sufficient for the local protection of the public health having first been universally conferred, it next, I submit, ought universally to be an obligation on the local authorities that those powers be exercised in good faith, and with reasonable vigor and intelligence. Though perhaps not of strict legal

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necessity, yet for convenience of common interpretation it seems desirable that the language of the law, besides making it a *power*, should also name it a *duty*, of local authorities to proceed for the removal of nuisances to which their attention is drawn; that thus, obviously to every one, any extreme sanitary neglect in a district should be an evil for which the Court of Queen's Bench, with its ordinary machinery of mandamus, could apply a remedy. And I would suggest that this remedy should in fitting cases be obtainable, either on the complaint of an aggrieved person, or on the motion of some appointed public complainant.

Fourthly, if the above-suggested changes were made, it would, in connexion with them, be desirable that facilities should be given for the creation of special *Nuisances Removal Districts*, by some such process as that which now creates districts under the Local Government Act. Particularly as regards large and heterogeneous Unions (such as now often are single sanitary jurisdictions) it would be much for the convenience of the Boards of Guardians, that the Secretary of State should, on the motion of the Guardians or otherwise, be able to divide the area into separate Nuisances Removal Districts, whereof each would then be governed, for sanitary purposes, by an elected Board of its own.

It would be superfluous for me here to specify the many minor amendments which, in addition to the above-suggested changes, are, in my opinion, needful for converting our present Nuisances Removal Acts into that which doubtless the Legislature intends them to be—an efficient sanitary law for all common purposes of the country. But as further points, where, in my opinion, amendment is particularly required, I may name the following:—(1) The absence of special provisions for the regulation of such work-places as are not under the Factory Law; (2) the want of precision and efficiency in the law relative to over-crowded dwellings; (3) the absence of provision, generally in the country, against the construction of houses unfit for healthy habitation; (4) the absence of reasonable restriction, summarily enforceable, on the frequentage of public places by persons suffering from dangerous infectious diseases; and (5) the absence of convenient local

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jurisdiction over the sanitary state of ships coming into relation with populous places. Partly with reference to some of the above points, and partly with reference to others which I do not here separately mention, I append [A] a memorandum with which, at my request, the Medical Officers of Health of the Metropolis have favoured me, stating where, in their experience, the health-statutes have been shown to require amendment. And I beg to refer to that memorandum, as representing the largest experience which can be quoted with regard to the present insufficiencies of the law for the purposes of large urban populations.

3. *Parasitic Diseases in Animals used for Food.*

Parasitic diseases in animals used for food.

In furtherance of an important object proposed by their Lordships in 1862—the object of getting due knowledge as to the states of disease by which animal food is rendered unfit for human consumption, and with particular reference to certain recent advances of scientific experience in some branches of the subject,—my Lords in 1864 ordered inquiry to be made as to the prevalence of parasitic disease (and especially of the so-called *trichina spiralis*) in the meat of the London markets, and as to the danger which such disease implies of infection of the human consumer. Dr. Thudichum was employed on this inquiry, and has furnished a report [A] on the subject in all its relations.

In my fifth report two years ago I submitted to their Lordships my then information on the practical bearings of the parasitic diseases of animals which are used for food. [See above, pages 75–90.]

During the two years which have elapsed since the presentation of my fifth report, progress has in many respects been made in knowledge of animal parasites, and especially a mass of most important experience has been collected with regard to the trichina spiralis. This microscopical threadworm has suddenly been shown to be of unsuspected importance to man. Happily not yet in England, but in several instances in Germany, the consumption of trichinous pork has been found at the root of local epidemics which of old

Parasitic diseases in animals used for food.

would doubtless have been confounded with fever. It was by the alarming significance of one particular occurrence of that kind in Germany in the autumn of 1863, that my Lords were induced to order the present special inquiry. In the little town of Hettstädt in Prussian Saxony, the utilisation of one trichinous pig (chiefly in festive celebration of the battle of Leipzig) had led to an epidemic of human trichiniasis wherein there were at least 158 sufferers, and no fewer than 28 deaths; and not even the Schleswig-Holstein excitement of last year prevented Germany, high and low, from recognising almost tumultuously that the physiology of the trichina spiralis was a question of great importance to the nation. How important, may be judged from those pages of Dr. Thudichum's report which tell of the Hettstädt epidemic, or by reflection on the fact that doubts were currently expressed whether the use of so staple an article of diet as pork ought not to be absolutely discontinued. The importance of the subject is likely to be less in England than in Germany, because in England that consumption of uncooked or imperfectly cooked pork which favours the ingestion of live trichinæ is vastly less frequent than in Germany; and, moreover, up to the present time trichinous swine do not seem to be of frequent occurrence in England. Still, in face of the circumstances to which I have referred, no apology will be needed for the very considerable extension which it has been thought desirable Dr. Thudichum should give to those parts of his report which relate to a parasite so dangerous and so easily overlooked. Indeed, altogether it has seemed expedient so to treat the whole subject of the parasitic diseases of stock, that the report may be referred to—and especially for medical purposes, as a monograph on that subject, and of course predominantly on its less familiar parts. It is with this view that the physiology of each parasite mentioned in the report has been discussed there at some little length; and that, in regard of trichiniasis —a subject almost new to this country—masses of detail are given (both from German experience, and from Dr. Thudichum's own observations) to illustrate the habits of the parasite, and especially the laws of its reproduction and migration, and the circumstances under which man is likely

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to be infected by it, and the symptoms which result from its presence in the human body, and the ways in which trichiniasis may be distinguished from the diseases which it most nearly resembles.

From the Eighth Report to the Privy Council, 1865.

[The Eighth Report comprises:—A section relating to Public Vaccination which has appeared in Vol. I., pp. 364-6; a section relating to the "Distribution of Disease in England," subdivided into (A) systematic proceedings and (B) occasional proceedings; a section relating to Foreign Epidemics of the year and the general question of Contagion in its bearings on the Public Health.—Ed.]

DISTRIBUTION OF DISEASE IN ENGLAND, AND THE CIRCUMSTANCES BY WHICH IT IS REGULATED—*cont.*

(A) *Systematic Proceedings.*

In pursuance of the systematic study which my Lords have for several past years had in progress in this department, as to the distribution of disease in England, and as to the circumstances by which the distribution is regulated, their Lordships in 1865 ordered some additional inquiries, generally of the same kind as heretofore, to be undertaken, and also, in one respect, opened a new line of investigation.

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1. Of these inquiries, so far as finished within the year, the largest related to the *Housing of the Poorer Population in Towns.* In general intention this inquiry harmonised with one which had just before been made into the housing of the Rural Poor. Both were undertaken with reference to projected amendments of the Public Health Law, and had for their chief object to ascertain how far that law in its present state enables local authorities to prevent dangerous degrees of overcrowding in dwellings, and the use of dwellings unfit for human habitation. In proceeding to investigate these

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questions, particularly in the present urban field of inquiry, an important distinction had to be observed. Wherever the evils in question should be found existing, heed would have to be given whether the authority was powerless to prevent them, or was merely unwilling to exercise its powers ; and, as powers for sanitary purposes are not in all places—especially not in all towns—the same, it would be necessary to distinguish places where the Local Government Act is in operation, or where special powers have been given by particular local Acts of Parliament, from places where only the general statutes are in force. Likewise the possibility would have to be regarded (and in the event this was abundantly realized) that in different places there might be different modes of interpreting the law. So the present urban inquiry was planned on a large scale. Besides dealing with the metropolis, and including (for important purposes of comparison) some examination of places in Scotland, it extended in extra-metropolitan England to fifty of our chief centres of population. Dr. Hunter was the inspector employed upon the inquiry.

Large as the inquiry was, and copious as are the resulting details of information, the broad results may be told in these very few words,—that, neither against degrees of crowding which conduce immensely to the multiplication of disease, as well as to obvious moral evils, nor against the use of dwellings which are permanently unfit for human habitation, can local authorities in towns, except to a certain extent in some privileged places, exercise any effectual control. Resulting from (or at least attributable to) this powerlessness of the authorities, which only sometimes was supplemented by strained constructions of the law, the evils in question were found very extensively, one or both of them, in operation. Especially they were seen abounding in some of the chief places which were visited ; perhaps worst in parts of the metropolis, and in Bristol, Merthyr, Newcastle, Plymouth and Sunderland. Moreover, though in various other places, including some of considerable importance, the evils were either not found existing, or not in important degrees, it must be remembered that even in these places, or in most of

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them, slight industrial or other local changes could rapidly and irresistibly develop high degrees of overcrowding. Adverting also to my last annual report, I may recall the fact, therein abundantly demonstrated, that even in small country towns and villages, where the evil least admits of excuse, overcrowding is often in glaring excess. And thus, speaking generally, it may be said that the evils are uncontrolled in England.

No one, I apprehend, can doubt but that this state of things contravenes the intentions of the Legislature. For when regard is had to the enactments already made in the matter—especially to the Common Lodging Houses Acts, and to those provisions of the Nuisances Removal Act which relate to overcrowding and to dwellings unfit to be inhabited, the Legislature is seen to have decided in principle that the evils in question must not be suffered to continue. And the fact that the evils do nevertheless continue, both in wide extent and often in great intensity, constitutes an evident and urgent claim for such new legislation as will amend the present technical insufficiencies of the law.

It is scarcely possible for the better-off classes to imagine, where duty has not given them opportunities of practically knowing, what immensity of baneful influence is included in the evils to which I advert ; and it may therefore be well for me to show what in practice are the forms in which the evils present themselves. By places " unfit for human habitation " I mean places in which by common consent even moderately healthy life is impossible to human dwellers,—places which therefore in themselves (independently of removable filth which may be about them) answer to the common conception of " nuisances ";—such, for instance, as those underground and other dwellings which permanently are almost or entirely dark and unventilable ; and dwellings which are in such constructional partnership with public privies, or other depositaries of filth, that their very sources of ventilation are essentially offensive and injurious; and dwellings which have such relations to local drainage that they are habitually soaked into by water or sewage; and so forth. But beyond these instances where the dwelling would, I think, even now be

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deemed by common consent "unfit for human habitation," instances, varying in degree, are innumerable, where, in small closed courts, surrounded by high buildings, and approached by narrow and perhaps winding gangways, houses of the meanest sort stand, acre after acre of them, back to back, shut from all enjoyment of light and air, with but privies and dustbins to look upon; and surely such can only be counted "fit for human habitation" while the standard of that humanity is low. Again, by "overcrowded" dwellings I mean those where dwellers are in such proportion to dwelling-space that no obtainable quantity of ventilation will keep the air of the dwelling-space free from hurtfully large accumulations of animal effluvium,—cases, where the dwelling-space at its best stinks more or less with decomposing human excretions, and where, at its worst, this filthy atmosphere may (and very often does) have, working and spreading within it, the taint of some contagious fever.* And as a particular class of cases, in which both evils are combined to one monstrous form of nuisance, I ought expressly to mention certain of the so-called "tenement-houses" of the poor; especially those large but ill-circumstanced houses, once perhaps wealthily inhabited, but now pauperised, and often without a span of court-yard either front or back; where in each house perhaps a dozen or more rooms are separately let to a dozen or more families—each family with but a room to itself and perhaps lodgers; and where in each house the entire large number of occupants (which even in England may be little short of a

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* Though my official point of view is one exclusively physical, common humanity requires that the other aspect of this evil should not be ignored. For where "overcrowding" exists in its sanitary sense, almost always it exists even more perniciously in certain moral senses. In its higher degrees it almost necessarily involves such negation of all delicacy, such unclean confusion of bodies and bodily functions, such mutual exposure of animal and sexual nakednesses, as is rather bestial than human. To be subject to these influences is a degradation which must become deeper and deeper for those on whom it continues to work. To children who are born under its curse it must often be a very baptism into infamy. And beyond all measure hopeless is the wish that persons thus circumstanced should ever in other respects aspire to that atmosphere of civilization which has its essence in physical and moral cleanliness, and enhances the self-respect which it betokens.—J.S.

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hundred) will necessarily have the use of but a single staircase, and of a privy which perhaps is placed in the cellar.*

That such influences as the above must be enormously fatal to health is, in the present state of knowledge, too obvious to need formal demonstration. When first, seventeen years ago, it devolved upon me (then officer of health for the city of London) to draw attention to the sanitary circumstances of great masses of metropolitan population, I showed, in regard of my then sphere of observation, that those evils were sufficient in their gigantic magnitude to neutralise whatever in other respects was being attempted for the improvement of health.† And now I am confident that I speak the sense of all who have had most to do with the administration of sanitary measures or poor law medical relief, when I affirm generally what was then but of partial application, and say that to provide for the public health in important centres of population must of necessity be a hopeless task, unless the administering authority be armed with ample powers to render impossible those conditions of lodgment which are of so deadly effect upon the poor. Not only Dr. Hunter's present report, written specially on the subject, but other of our departmental reports,‡ and, in addition to them, masses of independent evidence set before the public by persons officially

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* Mere scantiness of privy-accommodation leads, of course, to filthy habits among the lodgers of crowded tenement-houses. And when the pretended accommodation is given in the above-described form, often in utter darkness, the likelihood is that the basement of the house will be one indescribable quagmire of filth.—J.S.

† See Extracts from Reports, relating to the sanitary condition of the city of London, 1849 and 1850. Vol. I., p. 35.—J.S.

‡ See, for instance, in the Appendix to my Sixth Report the description which Dr. Stevens gives of the town of Cockermouth, and that which Dr. Bristowe gives of Whitehaven, as regards the dwellings of the labouring classes; also, in the Appendix to my Seventh Report Dr. Buchanan's statements as to the construction and overcrowding of the homes of the poor in Liverpool. Dr. Hunter's report in the same volume (on the house accommodation of rural labourers) gives, in relation to smaller places, innumerable pictures of overcrowding, and of such style of dwelling as are only borne in despair of better. See also in Seventh Report, Appendix, Dr. Stevens's account of the colliery settlements at Gilesgate Moor. And in the Eighth Report (Appendix) Dr. Buchanan on fever at Greenock.—J.S.

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or unofficially interested in sanitary improvement,* may be referred to for details in justification of that statement. And in Dr. Hunter's report will be found illustrated all those ambiguities or insufficiencies of law through which the evils in question are maintained.

The powers which, in the interests of our labouring population, it is most of all desirable that local authorities should be able and willing to exercise against the evils in question, are, in my opinion, these :—

(i.) to deal universally with overcrowding on the basis of its being technically a "nuisance," and to take, as the sole test of overcrowding, the proportion borne by number of occupants to size and ventilation of given space ;†

(ii.) to apply to the so-called "tenement-houses" ‡ of the poor a system of registration and regulation akin to that

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* I may particularly refer to the testimony of medical officers of health, especially those acting for the metropolis and Liverpool and Glasgow, and to Mr. Rendle's very impressive pamphlet (1865) on London Vestries and their sanitary work, and to the letters which have from time to time, within the last year or two, been written to the "Times" by Dr. Jeaffreson, Resident Physician of the London Fever Hospital, on the sources and distribution of typhus in the metropolis.—J.S.

† I think it practically important that in the letter of the law no distinction should be drawn whether overcrowders are of one family or more. Otherwise technical difficulties become insuperable. For what is a "family"? In one sense it means "children with their parents," but in another sense it may be extended to an entire clan. It may fairly be left open to magistrates (as a matter for discretion according to local and particular circumstances) to refrain from ordering the abatement of a given overcrowding if they see that it is of one family, and could not be abated without hardship. Further, in my opinion, it is to be desired that laws and regulations as to overcrowding should not proceed on the assumption that children (to any measurable extent) require less breathing-space than adults. Against any such assumption two facts have to be considered ;—first, that even healthy children, in proportion to their respective bodily weights, are about twice as powerful as adults in deteriorating the air which they breathe ; secondly, that the children will almost invariably have certain eruptive and other febrile disorders to pass through, from which adult life is comparatively exempt, and in which the requirement of space is greatly increased. And having regard to these two considerations, I think it best that children and adults should be deemed to require equal allowances of air and ventilation.—J.S.

‡ How to define the above-mentioned class of houses is a question which perhaps, ought to be noticed. "Tenement-house" is an expression applied to certain houses in respect of their being let or occupied in two or more "tenements." The term, if it were not expressly limited, would include all houses in which "flats" and other "chambers" are let. If it were thought

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which is applied to common lodging houses under the statutes of 1851 and 1853;*

(iii.) to enforce every where against the use of cellar-dwellings the restrictions which, under the 67th section of the Public Health Act, 1848, are enforceable in places which are under that Act and the Local Government Act;

(iv.) to exercise against premises or parts of premises which by want of access of light or air, or by dampness or through ruinous condition, are rendered unfit for human habitation,

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well, in any such provisions as I suggest, expressly to exempt houses of the richer sort (where of course the restrictions in question are not practically needed), this might easily be done by exempting all tenement-houses wherein tenements are separately rated, or wherein no tenement is let at a lower rent than (say) six shillings per week. Practically the "tenement-houses of the poor," so far as it is my object to provide for their registration and regulation, may be regarded as houses of the worst quality, in the worst localities, and with the worst provisions for cleanliness, occupied dividedly by as many, or nearly as many, families as they have rooms; so that each room, or, in rarer cases, each pair of rooms, is a family-holding, into which sometimes lodgers are received.—J.S.

* For the success of such a system as is proposed, powers which could not be dispensed with are these:—power to prevent the occupation of a house in several holdings, so long as its privy-accommodation and other means and appliances of cleanliness, and the ventilation and lighting of its common staircases and passages, are not such as to fit it for that kind of occupation:—power to fix for a house, according to its size, situation, construction, and conveniences, the number of holdings which may be separately let or occupied in the house, and the number of persons who may be received into any given holding:—power to require the same cleansings and limewhitings as are appointed for common lodging houses by the 13th section of the Act of 1851. Power, such as is given in regard of common lodging houses by the 7th section of the Act of 1853, to remove, in certain cases, persons who have fever or other infectious or contagious disease, is one which in the present state and circumstances of tenement-occupation, is often most urgently required. But if the preceding powers were duly exercised, this would be comparatively superfluous, and for obvious reasons only extreme circumstances could justify its exercise where the interference would be with purely domestic relations. The same remarks apply to the power (not given by the Lodging Houses Acts, but given, for instance, as regards the city of London, by the 90th section of the City Sewers Act) to cause in certain cases the removal of dead bodies from within houses. Of course in the case of tenement-houses provision would not have to be made for such reports as are ordered by section 8 of the Common Lodgings Act of 1853, nor for "separation of the sexes" in the sense of the statute of 1851. If it were deemed necessary to limit the power which I have named second in my list, a reasonable limitation of it would, I think, be this;—that every holding which has adequate provision for ventilation, and is not in a closed court, nor closely surrounded by buildings higher than itself, nor one of more than three holdings in the same house, should be deemed of size sufficient for its occupation, if its interior space (exclusive of lobbies, cupboards, and the like) affords to each man, woman, and child occupying it an

House accommodation of the poor.

the same powers as against premises which by "nuisances" are rendered unfit;*

(v.) to acquire premises, by compulsory sale, either in order to make needful openings and clearings where ground is too closely built upon, or for other sanitary improvements.

Exercising compulsory powers like the above, and therewith, so far as circumstances require, such powers as the Labouring Classes Dwellings Bill now before Parliament proposes to confer for the construction of new habitations, local authorities would in very few years bring within conditions of decency and comfort myriads who now subsist under conditions which it is dreadful to contemplate. And as regards the accordability by the Legislature of such restrictive and compulsory powers as I have proposed, I venture to submit two arguments:—first (as I have already stated), that the objects which such legislation would tend to compass are objects for which, in principle, the Legislature has already declared itself; and, secondly, that each of the powers which I name, as powers universally to be desired, is a power already legally exercised in some part or other of the country. In the latter point of view I would particularly beg leave to refer to the improvement-powers which are exercised in Liverpool under the local Act of 1864, and in Scotland under section 161 of the Scotch Police and Improvement Act; also to the powers which, in Glasgow under the local Police Act of 1862, and especially under its sections 384–8, in the city of Dublin under the 24th section of the Dublin Improvement Acts Amendment Act, 1841, and in the city of London under the City Sewers Act, 1851, are exercised against the crowding of tenement-houses.

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average of 500 cubic feet per head; and that in no case the authority should be entitled to require a larger allowance as aforesaid than 1,000 cubic feet per head.—J.S.

* At present in respect of premises where "nuisances" exist—*i.e.*, nuisances of the sorts enumerated in the 8th section of the Act of 1855, justices can, if they think it necessary, prohibit the using of the premises till the nuisance in question is removed; but there seems to be some difference of opinion whether the very serious constructional faults to which the above text refers—faults, which in their higher degrees ought absolutely to disqualify premises from being inhabited, are in the present law, technically a "nuisance."—J.S.

House accommodation of the poor.

In concluding this section of my report, there are two more observations which I would venture to submit. In the first place, with regard to some of the worst conditions of dwelling in towns, it is scarcely possible that thorough reforms should be accomplished, unless large improvement-powers are in the hands of the local authorities, and are so exercised by them as gradually (by the requisite clearings of ground) to provide light and air for masses of population who now dwell in dark and unventilated places, or, where such clearings cannot be made, to purchase and destroy the poorer dwellings as "unfit for human habitation," and to provide equivalent new dwelling-space in the suburbs of the town:—and I am glad to mention here two cases, where munificent beginnings of this sort are being made; Liverpool, where 100,000*l.* has been voted and is in course of being expended, for that one purpose; and Glasgow, which is now asking Parliament to sanction its spending within the next twenty years no less a sum than 1,250,000*l.* on improvement-purposes in great part similar. In the second place, I would advert to the uncompensated dislodgment and inconvenience which the laboring classes from time to time suffer through the destruction of parts of towns required for railways and other public purposes, in which parts they have hitherto had their homes. And I would suggest for consideration whether, when compulsory powers of purchase are being sought of Parliament for purposes of the above description, it would not be desirable that the local authority which is exercising improvement-powers on behalf of the laboring classes (and also perhaps individuals interested, as employers of many hands, or otherwise, in the well-doing of work-people) should have a *locus standi* for opposing the grant of such powers, except on condition that where many habitations are destroyed at least as many should be substituted for them. On this subject I beg leave to quote, as of the highest authority which special legal experience in such questions can give, an expression of opinion with which I have been favoured by Mr. John Bullar:—"It has been objected that it is "foreign from the objects of (for instance) a railway company to make them house speculators, and force them "to lock up part of their capital in dwellings for the "laboring classes; but this objection is altogether futile. "Where it suits the interests of the shareholders, a railway "company may add to their railway a canal, a dock, a harbour, a toll-bridge, a toll-road, or an hotel; and railway "companies not only may, but in countless cases must, "expend capital in making, and income in maintaining, for "the landowners whose lands they touch, roads, sewers, "drains, level crossings, bridges, cattle-creeps, watering-places, fences, and sometimes capital in providing farm "buildings. The Lands and Railway Clauses Acts provide "that ample compensation in money or works or both shall "be made to landowners whose interests are interfered with, "but do not make adequate provision for protecting the "poor, whose means of living may be seriously lessened by "the exercise of the powers of those Acts. There is nothing "inconsistent with the course of legislation for public works "that their undertakers should build as many houses as "they pull down, just as they make a new piece of road "where they block up the old road; and there is no reason "why they should not sell their houses as soon as they think "fit. The Lands Clauses Act requires them to sell within "ten years after the completion of their works. If they "lose by the sale the amount of the loss is the amount of the "compensation unproductive to themselves which they "make to the poor whom they dispossess; but with ordinary "prudence they often may so arrange their building and "selling operations as, if not to give them a profit, at least "to make their loss a most insignificant part of their total "outlay."

House accommodation of the poor.

2. A second large inquiry which my Lords undertook in 1865, but which could not within the year be completed, related to places in which, for some considerable number of years, proper works of drainage and water-supply have been established, or particular sanitary regulations been in force, and aimed at ascertaining, by local inquiries and examination of mortuary returns, what has been the *effect of the works or regulations in improving health* in each respective place.

Effect of sanitary improvements.

Effect of sanitary improvements.

Dr. Buchanan is the inspector who has been employed on this inquiry. The places in which hitherto his investigations have been made—certain places, namely, in which the Public Health Act had been long adopted, and sanitary works under it had been constructed, are as follows:—Salisbury, Macclesfield, Croydon, Alnwick, Penrith, Morpeth, Ely, Ashby-de-la-Zouch, Carlisle, Leicester, Rugby, Stratford-on-Avon, Banbury, Warwick. His reports on these places have reached me too late to admit of their being included in the volume for this year, 1865. Both on this account, and also because the inquiry is being extended to other places, I think it best now to refrain from putting forward the conclusions which hitherto seem probable results of the inquiry. But I hope that in my next report I shall be able to present all the evidence which this inquiry aims at collecting, and at the same time to state conclusions which may be permanently valid (and I believe will be highly interesting) as to the practical fruit of our best-tested sanitary improvements.

Question of injury from infected rags.

3. With a view to obtain, if possible, more exact knowledge than was hitherto existing as to one particular alleged cause of disease—the *alleged occasional conveyance,* namely, *of morbid contagia in the various stuffs which form the staple of the rag trade,* I, under their Lordships' orders, instructed Dr. Bristowe to make detailed inquiry in quarters where affirmative evidence, if producible, would most readily be found, and especially in great paper-making establishments, as to any known facts which might seem to justify the suspicion referred to.

Dr. Bristowe, after visiting many establishments in London of rag merchants and marine storedealers, and 86 paper mills, scattered in various counties of England, gave me the report which I append [A].

It is matter for congratulation that the results there recorded are almost entirely negative, and such, I think, as fully to establish that the rag-trade does not play any considerable part in the distribution of contagions of disease. More than this cannot, I apprehend, be maintained. When

Question of injury from infected rags.

regard is had, on the one hand, to the sources of rag-supply, and on the other hand to the known properties of certain contagia, no one can suppose that paper-mills do not sometimes receive rags with infective material among them; and it would not have surprised me, if cases more or less authentic had been reported, where not only smallpox and other fevers, but also syphilitic inoculations, had, on particular occasions, been ascribed to the agency of foul rags. It will be observed, however, that, except in regard of smallpox, no such accusations came under the inspector's notice; and the instances wherein it was with some show of probability alleged that smallpox had been introduced by rags cannot be deemed to represent, in a vaccinated country, any serious amount of public danger.

I have already elsewhere submitted my opinion (and must hereafter return to the point) that the Nuisances Removal law of the country requires to be strengthened by provisions, which may be summarily used, against such sorts of personal conduct as tend unnecessarily to spread dangerous infections of disease.* It seems to me that if provisions with that object are to exist, the offence of knowingly contributing to circulate rags which have been imbued with infectious material would almost of course fall within their scope. And, so far as present information extends, nothing further than that could be desired in the way of legislative precaution against the danger.

Scientific researches.

4. It remains to be mentioned under the present head that, in aid of the more immediately practical objects of the department, my Lords, early in 1865, ordered certain *scientific researches* to be begun. Inquiries already made and reported on had set before the Legislature and the public much information, collected according to the current lights of medical science, with regard to the distribution and causes of all our most destructive diseases. The relations of typhoid fever and other diarrhœal infections to the presence and decomposition of excremental impurity in air and water,—the

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* See below, pp. 248–52, last section of Report.—J.S.

Scientific researches.

relation of the most fatal afflictions of artisan life to mere want of common ventilation, or of dust-withdrawing ventilation, in places of industry,—the relation, similarly, of miners' lung-diseases to the insufficient ventilation of mines, —the relation of our highest infantine death-rates to that neglect of infants, too often an almost murderous neglect, which follows the extensive industrial employment of women, whether in factories or in gang-agriculture,—the relations of unconquered smallpox to ill-performed vaccination, and of this to demonstrable faults of local arrangement,—the relations of contagion to the spread of disease in different circumstances of life, and of overcrowding to the power of contagion,—these very important ætiological relations had been studied, in their broadest bearings, in a large number and variety of local inspections throughout England, as well as in elaborate mortuary statistics; and the results of the study had been laid before Parliament, with other sanitary information, in the successive annual reports of the department. My Lords had now to determine what was to be done in the way of further like proceedings. It was submitted to them that by renewed inquiries, of exactly the same kind as heretofore, they might extend, but perhaps not importantly strengthen for practical purposes, the evidence already elicited on the great subjects which had been in hand; and that inquiries, tending chiefly to produce repetitions of evidence, would be but of secondary interest. Also it was submitted that, in the establishment of new principles for the prevention of disease, great steps of progress were now not likely to be made otherwise than with improved methods of ætiological observation;—that scientific researches must first have created a far more intimate knowledge than is yet current as to the nature of the morbid processes which are to be prevented, and as to the physical and chemical conditions of their development;—that such researches, on the scale and system which were to be desired, were not likely to be undertaken here by private investigators;—that, if their Lordships' inquiries were to continue to give fruit of national interest and importance, collateral work, aiming at such knowledge as I have just

Scientific researches.

spoken of, must be combined with their Lordships' former line of inquiry, and serve hereafter in some sort as its pioneer.*

My Lords having instructed me to act in accordance with these views, investigations of the kind in question became in 1865 part of the work of the department. Hitherto they have had relation only to the chemical processes of disease, and here, under their Lordships' authority, I have had the advantage of Dr. Thudichum's assistance. At present I have only to name these investigations as of the category of work in progress. On future occasions I shall hope to particularise the proceedings, so far as their very technical subject-matter will permit, and of course from time to time to give their practical results. It may be, however, that these will not so much admit of popular appreciation as they will conduce to urgent professional requirements. The work is not of the kind which can promise either immediate returns, or such returns as are most popularly striking. But that medicine in its most practical aspects, whether preventive or curative, needs constant aid and guidance from purely scientific researches, is a fact on which it would be superfluous to insist. Of the convictions which in this respect are universal among enlightened persons, perhaps no stronger illustration could be cited than the urgency, almost the clamour, with which such researches were recently called for in relation to the steppe-murrain now in England, and the scale on which the Royal Cattle-Plague Commission ordered them. Also in another point of view I may refer to those researches for an illustration. Undertaken as they were in the medical interests of horned cattle, they yet elucidated some processes of disease in a way which is of interest to human pathology, and, through it, to the preventive medicine of mankind.*

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* In relation to one very important disease, opinions like the above had, ten years previously, been pressed upon the attention of Government by the Medical Council, which the President of the then General Board of Health had called together to advise him on the then prevailing epidemic of Asiatic cholera. See Report of Medical Council, p. 8, and Report of the Council's Committee for Scientific Inquiries, pp. 65-6, among papers of General Board of Health laid before Parliament with reference to the Cholera-Epidemic of 1853-4. But cholera is only one of innumerable illustrations which might be adduced of our present practical standstill for want of deeper scientific insight.—J.S.

(B) *Occasional Proceedings.*

Occasional proceedings.

Besides inquiries systematically contributed as aforesaid to elucidate the common sanitary state and circumstances of the country, miscellaneous inquiries, which of course have tended to increase knowledge in the same direction, were made on many particular occasions, and generally at the instigation of local applicants, either with reference to actual excesses of disease, or with reference to conditions of filth from which such excesses might result. On occasions of the one sort or the other, my Lords, during 1865, ordered that inspectors should visit the following places:—*Greenock* and *Bristol*, where in both instances typhus was epidemic, and the local authorities requested my Lords to assist them by inquiry and advice; *Maidenhead*, where there was a very unusual concurrence of deaths by puerperal fever; *Great Ormesby* and *Waltham Abbey*, where there had been outbreaks of diphtheria; *Wellington* and *Aston Clinton*, where scarlatina had caused anxiety; *Harting* and *Hadlow*, where there had been typhoid fever; *Southampton* and *Epping*, where cases of Asiatic cholera had shown themselves, and, in connexion with the inspection of Epping, *Leytonstone*, where a drainage-nuisance was much complained of; *Swansea*, where cases of yellow fever had occurred; *Chichester*, *Leeds* and *Harwich*, where question had arisen as to the sufficiency of action taken by the local authorities for the protection of the public health. In Woolwich, where fever had been epidemic, an inquiry which had been begun in 1864, and which therefore my last Report mentioned as in progress at the end of the year, was completed. And besides the above cases, where local inspections were made, my Lords, on other occasions of local complaint or alarm, had written communication with the authorities of these other places, viz.:—*Newton* in the Chesterton Union, *Deptford*,

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* I refer particularly to the researches of Dr. Sanderson (reported in the Appendix to the Third Report of the Royal Cattle Plague Commission) on the propagability and incubation of cattle-plague, and on the physical state of its contagium.—J.S.

Occasional proceedings.

Paddington, *St. Pancras*, *Farnham*, *Horfield* in the Clifton Union, *Debenham* in the Bosmere and Claydon Union, *Waltham Abbey, Bethnal Green*, *Colney Hatch, Camberwell, Shirley, Whitstable, Bury, Golborne* in the Leigh Union, *Wistanstow* in the Church Stretton Union, *Silver Hill* in the Hastings Union, *Birling, Aylesford*, *Brundall* and *Bradestone* in the Blofield Union, *Watlington* in the Henley Union, *Standon* in the Ware Union, *Maidenhead, Ramsey* in the Huntingdon Union, *Child's Hill* in the Hendon Union, *Otley, New Shoreham, Burton-on-Trent, Headcorn* in the Hollingbourne Union, *Tottenham, Twickenham, Maidstone, Basingstoke, Enfield, South Shields, Wing, Kensington*, *Clapton, Hounslow, Cleator.*

Concerning the cases where inspections were made, excepting those of *Bristol, Wellington,* and *Woolwich,* I subjoin either the reports or extracts from the reports [A] which I received from the inspecting officers.* To the cases of *Southampton, Epping,* and *Swansea,* I shall refer in later sections of this report. To the case of *Maidenhead* I need not further advert than to say that the mortality which had occurred in that town was, in my opinion, sufficiently accounted for by the facts of obstetrical practice which the inspector (Mr. Radcliffe) sets forth in his report. Except as regards these cases, the main interest of the papers which I append consists in their bearing on the question which was discussed in my last year's report—the very important question of the working of the Nuisances Removal Acts in England. The report on *Greenock* is of course not relevant to that question, but is valuable here for the more general purpose of showing to what monstrous degrees of overcrowding and filth, and to what consequent sufferings by disease, a population (even when its industrial circumstances are prosperous) may be brought by the unregulated use of tenement-houses. The remaining cases may be regarded as supplementary

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* At Bristol there was insufficient hospital accommodation for the poor with typhus, and the chief object of the inspection was to see to means for increasing the accommodation. At Wellington no question of much practical interest was raised. Regarding Woolwich, further inquiry did not add anything important to the information given in my last annual report.—J.S.

Occasional proceedings.

illustrations of the argument of my last year's report on the inefficiency of our Nuisances Removal law :—*Aston Clinton*, with the pestiferous crowding of its children in plaiting schools,—*Great Ormesby*, with its structural nuisances,—*Waltham Abbey*, with its sewage-ditch continuing, in spite of remonstrances, under jurisdiction of a local board of health,—*Hadlow*, with its cesspools and stinking drains,—*Harting* (in the often complained of Midhurst Union) with its drinking-water almost ostentatiously polluted by excrement, and filth piled up as though it were treasure,—*Harwich*, with no useful memory of its former sufferings by cholera, but still cesspooled to the worst degree, and still with the worst of water-supplies,—*Chichester*, an episcopal city, a municipal and parliamentary borough, where still the inhabitants drink from beside their cesspools, and endure once a fortnight the almost unique nuisance of a very large cattle market in their streets,—and *Leeds*, with such an adminstration of the Nuisances Removal Act as, in proportion to the importance of the town, may perhaps be deemed the worst which has come to the knowledge of this department.*

In order to do full justice to these cases in their illustrative relation to the efficiency of the Nuisances Removal Acts, it is requisite to remember that the year 1865, with its incessant alarms and public and private manifestos as to the approach of epidemic disease, was eminently a year when it might have been expected that the authorities would not be sleeping at their posts. Yet, adverting also to the evidence which was given on these matters in my last annual report, I cannot doubt but that the few above-mentioned instances represent innumerable others, now existing far and wide throughout the country.

As regards the correspondence which my Lords had during the year, on questions generally of the same nature as the above, I need only observe that the complaints which were addressed to their Lordships tallied with and corroborated the

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* I am glad to state, as the sequel of the communications which my Lords have addressed to the town council of Leeds on the sanitary state of the town, that for some time past considerable exertions have been making there to amend the state of things described in Dr. Hunter's report.—J.S.

Occasional proceedings,

opinion which I have expressed as to the frequent inoperativeness of our present sanitary laws, and that my Lords were unable to suggest remedies to persons who addressed them on this subject.

One case, however, deserves particular mention. From the respective vicars of Aylesford and Birling, two parishes in the *Malling Union*, my Lords in September last received complaints that the board of guardians refused to act in execution of the law, as authority for the removal of nuisances; the first complainant adding that a case of cholera (fatal after seven hours' illness) had just occurred in his parish; and the second, that, in a hamlet in his parish, always more or less marked by illness, where the people had open cesspools about their houses, and were drinking polluted water, fever was spreading fast from house to house. In answer to a letter which my Lords hereupon immediately (Sept. 14) ordered to be addressed to the board of guardians, inquiring on the subject, the clerk on the 27th September wrote that the guardians had directed a special meeting to be called for that day fortnight to take their Lordships' letter into consideration; and on the 11th October he wrote—" that at a special meeting held this " day to take into consideration the Nuisances Removal " Acts, it was moved that it was inexpedient to adopt those " Acts, whereupon an amendment was proposed that they be " adopted, and negatived by a majority of six to five." On receipt of this answer, my Lords directed a second letter to be written (Oct. 12) requesting to be informed of the precise meaning of this resolution, inasmuch as the Acts were general and did not require to be specially adopted, and asking particularly whether the guardians declined to receive complaints and to take proceedings under the Acts. To this second letter the guardians, on the 18th October replied, " that they con- " sidered the resolution passed at the meeting to be a sufficient " expression of their meaning, which was, that they did not " consider the 5th section of 23 and 24 Vict. c. 77. to be impera- " tive, and they therefore declined to appoint a committee " under that section." While this reply was still under their Lordships' consideration, one of the complainants wrote that, in some uncertainty whether their former applications to the

Occasional proceedings.

board of guardians had been in all respects strictly in order, and in hope that the decision of the former meeting of the board might be reversed by another and larger meeting, they had decided to recommence their endeavours to move the board. Again, delay was interposed by a fortnight's adjournment of the board, and it was not till the 18th November that my Lords received the following information from the vicar of Birling: "The board of guardians has not thought " fit to make any reply to the memorial from this parish or " to my own letter (both dated 28th ultimo) but I am " informed by the elected guardian of this parish the matter " of the nuisances in Aylesford, Birling, and Snodland parishes " was pressed at the adjourned meeting on the 15th instant, " when the adoption of the Nuisances Acts was strongly " advocated by E. L. Betts, Esq., and others, but as strongly " opposed by the chairman, whose statements of the operation of the law at last secured a majority of one against the " adoption of the Acts." A letter to the same effect was received from the other complainant; and on the 21st my Lords received from the rector of Snodland, a third parish in the union, complaints that nuisances existed also there to an alarming extent, that typhus and diphtheria abounded, and that by the decision of the Malling board the inhabitants were left without any local authority to whom to apply. My Lords now brought the correspondence under the consideration of Secretary Sir George Grey; who referred it to the Attorney and Solicitor General for their opinion, whether, under the circumstances represented, proceedings should be instituted against the guardians of the Malling union, with a view to compel them to take such measures as were necessary for the protection of the public health. On the 28th December the answer of the law-officers was reported, to the effect that, in their opinion, there was not legal ground for the institution of proceedings against the guardians. The case requires no comment from me, but I beg leave to add the remarks with which the law-officers concluded the expression of their opinion:—"It is evident that the legislature has hitherto " thought it sufficient to rely mainly on the vigilance and " discretion of the local authorities, without providing against

" any perverseness or voluntary neglect on their part; and
" the present case seems to show that in some districts, at all
" events, further security is required for the public good."

FOREIGN EPIDEMICS OF THE YEAR, AND THE GENERAL QUESTION OF CONTAGION IN ITS BEARINGS ON THE PUBLIC HEALTH.

Foreign Epidemics and Quarantine.

In relation to the spread of pestilential disorders, the year 1865 was of extraordinary and most painful interest. That in this year, after more than a century's interval, the herds of England were revisited by the most malignant of bovine plagues—the, to them, unfamiliar murrain of the Russian Steppes, would in itself be a sad distinction of the year. But the eventfulness of 1865 was even less in that field of suffering than in relation to human epidemics, and, in the latter respect, to persons who had to care for the public health, the last nine months of the year were a time of continuous anxiety. First, early in April, it was rumoured that a disease of the nature of *Plague*, coming from beyond the Ural Mountains, and causing depopulation in its course, had not only reached St. Petersburg, where it was said to be causing fearful ravages, but had spread beyond the Prussian frontier, and was prevailing, though in a less destructive form, at Dantzig and various other places in North Germany. Next, in June, came the importation of *Asiatic Cholera* into Egypt, and thereupon, radiating from Alexandria, for results which as yet have but begun, the renewed influence of this terrible infection in Europe. Thirdly, in September, there was the fact—hitherto, I believe, unparalleled in the epidemiological experience of this country, that an outbreak of *Yellow Fever*, fortunately not on a large scale, was occasioned to the population of Swansea by the arrival of an infected ship from Cuba.

It was but to a very limited extent that these important occurrences involved proceedings which technically were under the Public Health Act, 1858; and, strictly speaking, Foreign Epidemics and Quarantine.

proceedings under that Act are all that I am called upon to mention here. I may, however, so far exceed that limit as to include certain other proceedings which the same occurrences involved, and which were of general sanitary interest: proceedings of the Lords of the Council, which were either taken under the Quarantine Act, or at least had regard to its administration.

"Siberian Plague."

1. The first of the occurrences to which I have adverted, the rumour in April last that a "Siberian Plague" was advancing towards this country, was one which, except for the proverbial faculty of rumour to distort as well as magnify what it represents, might have justified the greatest alarm.* And it was of course one which tended to raise a question of quarantine. Under the circumstances, my Lords thought it expedient that the facts should be investigated from this department, and, at their desire, I took the requisite steps for that purpose. Dr. Whitley was sent to St. Petersburg, and Dr. Sanderson to the country of the lower Vistula. The results of these investigations are contained in papers which I subjoin [A]; viz., a report which I addressed to the Lord President on the 19th April, and reports subsequently made by the two inspectors. Briefly, I may here state that the rumour which gave rise to the inquiry had joined together and disfigured two mutually independent truths; one, that our well-known typhus and relapsing fevers were epidemic in St. Petersburg; † the other, that

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* Terrible inflictions have before now come to us by that line of transit, and cholera is not the only pestilence which has thus come. Apparently it was through Russia, and perhaps as a "Siberian Plague," that, five centuries ago, the Black Death came to England. That, according to the best authorities, the Black Death, under the name of Pali Plague, still lives, and from time to time spreads, in the western and northern parts of India, and, when last told of, was even high in the Himalaya; that, if its infection passed the hills, little story would come to us of how it filtered through the sands of nomad and other savage life; but that presently it might be on the confines of Russia, and then again suddenly of the gravest European interest;—these are considerations which, in the minds of persons who know the facts of the case, would check all disposition to treat rumours of "Siberian Plague" with indifference. —J.S.

† It may be worth noting, that among the very various information which reached me from Russia about the time when the above proceedings were in progress, I found, as one element of confusion in the popular impression of the

cerebro-spinal meningitis—a peculiar nervous fever, hitherto scarcely known in England, was epidemic in parts of North Germany.

"Siberian Plague."

It is only with respect to the latter disease that I need here make any further statement. From communications which have been made to me since the time when the inspectors reported, and particularly from information for which I am indebted to Dr. F. J. Brown, of Rochester, and to Dr. Clapton, one of my colleagues at St. Thomas's Hospital, I have reason to believe that for some time past the disease has been present in small amount in this country. I subjoin the substance of the communications with which Dr. Brown and Dr. Clapton have favoured me [A]. It is, in my opinion, unquestionable that some of the cases illustrate in sporadic form the same cerebro-spinal meningitis which in other countries has prevailed epidemically. And to this I may add two considerations. First, the morbid influence may perhaps to some extent show itself otherwise than in marked cases of idiopathic cerebro-spinal meningitis: experience of parallel circumstances suggesting as possible, that the mysterious "epidemic constitution" (as Sydenham would have called it) which favours the specific nervous fever in a given time and place, may also, to some extent, colour other diseases of the time and place with nervous, particularly tetanic or tetanoid, complications, and that an increased tendency to such complications may suffice to show the "epidemic constitution:" and both Dr. Brown and Dr. Clapton in their respective fields of observation are struck with evidence that of late this or something like it has been the fact. Secondly, it has to be remembered that till a disease is generally known to the medical profession, and is known by a distinctive name, solitary cases of it are easily confounded, either in fact or in name, with other more familiar diseases: that probably cerebro-spinal meningitis will thus to some extent be confounded with lock-jaw and

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case, that a carbuncular disease of cattle, which was prevailing in parts of Russia, and which, according to a well-known property of such diseases, had in some cases led to infection of human beings, was being spoken of as "Siberian "Plague."—J.S.

"Siberian Plague."

hydrocephalus, just as diphtheria ten years ago (when the present generation began to make their first practical acquaintance with it) was confounded, either in fact or in name, with various better known throat-affections and with scarlatina.

Asiatic Cholera again in Europe.

2. The choleraic infection of Egypt in May last, with the return of Mohammedan pilgrims from Mecca where the disease was epidemic; followed soon afterwards by the spread of the same infection, along each of the several lines of steamboat communication which diverge from Alexandria as a centre, to all the most considerable ports of the Levant and of Southern Europe; whence again in many instances inland spreadings of the disease took place;—this constituted a succession of events which augured badly for the public health in England. And presently, in the quarter where it was being looked for, a first wave of the infection had touched our shores, though happily not yet greatly to harm us. For the first time in our experience of cholera, the attack was on our south coast: not as on former occasions on our ports which look toward the Baltic: but on Southampton, distinguished among all our ports as the one of quickest Mediterranean traffic, and perhaps also (though this may have been secondarily) on Weymouth or Portland or Dorchester.

Of the epidemic progress which I have just summarily sketched, I do not attempt here to give the innumerable and somewhat intricate details, nor to compare the present course of the disease with steps of former visitations. On that subject, under their Lordships' orders, I requested Mr. Radcliffe, honorary secretary of the Epidemiological Society, to compile a special report; and, for the purpose, I put into his hands all the abundant information which the Foreign Office had communicated to their Lordships. The elaborate report with which he has recently furnished me, and which I append *in extenso*, gives all information which has hitherto been obtained as to the epidemic progress, compares the present with former invasions, and gives some interesting supplementary information as to the Mohammedan pilgrimages, in their relation to the present subject.

Asiatic Cholera again in Europe.

Of the very small share which England has yet had in the epidemic, the main facts are these. Into Southampton there came on July 10th, and at intervals afterwards, very suspicious arrivals from Alexandria, Malta, and Gibraltar. In the middle of August, a young woman in the town had a choleraic attack of doubtful nature; on the 22nd September a labourer had undoubted Asiatic cholera, of which afterwards he died; and from then, for about six weeks, cholera-cases continued to occur in small numbers in and about Southampton, so that on the 4th November (when the little epidemic might be considered at an end) there had been in all 60 such cases, of which 35 had terminated in death.

It is a question whether from Southampton, or in any more direct way, the morbific influence may in August or September have reached Weymouth or Portland or Dorchester: I have no proof that any such infection took place: but accidentally I am informed that a gentleman from a distance, who early in August was spending a week in Weymouth, and visiting both Portland and Dorchester, contracted during that week a diarrhœa which on his return home developed to severe cholera; and in September there occurred, in the neighbourhood of London, the following events which give peculiar interest to the question. Mr. G. and his wife, inhabitants of Theydon-Bois near Epping, had been lodging at Weymouth for seventeen days from the 8th September, had visited Portland on the 22nd, and Dorchester on the 23rd, and returned home on the 25th. On the evening of the 23rd Mr. G. had been seized with diarrhœa, sickness and cramps, which continued more or less through the next day, and left him still unwell on the morning of the 25th. He, however, performed his journey to Epping with his wife. She, during the journey, began also to complain of abdominal discomfort; and this, after her return, developed, with gradually increasing diarrhœa, to cholera, of which (in its secondary fever) she eventually died on the 11th October. On the 30th September (while the last-named patient was still in collapse) one of her daughters, aged eight, was seized with cholera, and in a few hours died. That same night, a serving-lad in the house was seized with cholera, and barely

Asiatic Cholera again in Europe.

escaped with his life. On the 2nd October, the doctor who was attending them died of cholera, after ten hours' illness. On the 3rd, another daughter of the house, aged 16, passed into cholera, but eventually, after some consecutive fever, recovered. On the 5th, a maid-servant got diarrhœa, which, though relieved for the time, relapsed and became choleraic on the 8th, and she, after some promise of recovery, fell into secondary fever, with which she eventually died. On the 5th also a labourer who worked on the premises, but lived apart, was taken with diarrhœa, which, passing on to cholera and collapse, killed him next day but one. On the 6th, the head of the house, the Mr. G. who had suffered at Weymouth, and had ever since had relaxed-bowels, got a very acute new attack, and died after 15 hours. On the same day his son was attacked with diarrhœa, and next day was in collapse, but rallied, and finally got well. Also on the 6th, the grandmother of the house was similarly attacked; and she, though she emerged from collapse, eventually died on the 14th. On the 10th a woman, living near by, whose only known connexion with the above cases was that on the 8th she had assisted in laying out the dead body of the above-mentioned labourer, was taken with choleraic purging, which soon led to collapse, and next day to death. Thus, within a fortnight, in that one little circle, eleven persons had been attacked with cholera,—mother, father, grandmother, two daughters, son, doctor, serving-lad, servant-maid, labourer, and country-woman; and, of these eleven, only three survived—the son, a daughter, and the serving-lad. Later, in the country-woman's family, there was another fatal case. It cannot well be doubted but that the exciting cause of this succession of events was, in some way or other, the return of the parents from Weymouth—of the father with remains of choleraic diarrhœa still on him, of the mother with apparently the beginnings of the same complaint. But this is only part of the case, and the remainder teaches an impressive lesson. All drinking-water of the house came from a well beneath the floor of the scullery; and into that well there was habitual soakage from the water-closet. Whether, in intimate

Asiatic Cholera again in Europe.

pathology, there are any essential differences between the cholera which kills on a large scale, and the cholera which kills single victims, is hitherto so entirely unknown, that it would be idle to discuss, as a separate question, whether the G. illness, contracted at Weymouth and carried to Epping, was "epidemic" or "sporadic," "Asiatic" or "English," cholera; and, as above stated, I cannot prove it to have been an offshoot of the Southampton epidemic, or otherwise of Mediterranean origin. Certain, therefore, only is this:—that, from the time when Mr. and Mrs. G. returned ailing to their home, the discharges which passed from their bowels gave an additional and peculiar taint to the already foul water-supply of their household, and that thenceforth every one who drank water in the house drank water which had in it the ferment of decomposing diarrhœal matters.

In relation to these, on the whole, inconsiderable manifestations of epidemic cholera in England, proceedings under directions of the Lords of the Council were taken as follows. With the assistance of Dr. Parkes, Professor of Military Hygiene at Netley Hospital, I watched the progress of the epidemic at Southampton, and addressed to the local authorities such suggestions as were necessary. And as soon as information came of the lamentable occurrence at Theydon-Bois (which unfortunately was not until all the above-described mischief had been accomplished) I instructed Mr. Radcliffe to investigate the facts, and to give such advice as might be useful. Professor Parkes made peculiarly exact inquiry into all the circumstances connected with the beginnings of the epidemic in Southampton, and into the relations of the cases to one another; and I append his report in extenso, not only for the positive information which it contains, but also as an useful illustration of the extreme difficulty which in all such matters there is in proving or disproving contagional relations. From Mr. Radcliffe's report I append [A] the section which describes in detail the circumstances of the infected water-supply.

And here terminates, for the year 1865, the history of cholera in England. What may be the facts of 1866, or what eventually will have been the share of England in the present pandemic diffusion of the disease, are questions on which no materials for exact judgment exist, and where at any rate hope may be preferred to prediction.

Yellow fever at Swansea.

3. The outbreak of Yellow Fever at Swansea in September last was in one respect an event of extreme importance. That England is not insusceptible of this tropical infection, but that (at least under favouring circumstances) yellow fever can seriously damage a port-side population in England: this truth was conclusively discovered in Swansea at the cost of fully fifteen lives. Doubtless the atmospheric conditions under which the proof was given were conditions not habitual to our climate. Especially the heat was almost tropical. But no one can predict of any given year that its summer shall not reproduce the conditions which characterized the summer of 1865; nor can any one say that, if yellow fever infection should again begin to operate on our population, the mischief may not infinitely exceed those limits within which on the recent occasion it was confined. And accordingly, for the purposes of hygienic police, the outbreak to which I refer must be deemed to have given a most impressive warning.

The broad facts of the case may be told in very few words under the following two heads. First, the *Hecla* left Cuba on the 26th July with cases of yellow fever on board, had successive new cases till towards the end of August, entered Swansea harbour on the 9th September, with one of her seamen dying and two others but convalescent from the fever, and was immediately moored alongside a wharf; where she landed her sick, discharged (though not uninterruptedly) her cargo, and remained stationary till the 28th; when remonstrances, which at last had become irresistible, led to her being removed from within the dock. Secondly, from September 15th, six days after her arrival, to October 4th, six days after her removal, Swansea witnessed the entirely new phenomenon of yellow fever attacking in succession some twenty inhabitants of the town, besides others who suffered less definitely, or more mildly: and this not indiscriminately over the whole large area of Swansea, but only in definite

Yellow fever at Swansea.

local relations to the ship: while at Llanelly there also fell sick in the same way three of the crew of a small vessel which had been lying for two days alongside the *Hecla* at Swansea.

While this mischief was in progress notice of it came to the Lords of the Council. On the 14th September, I received from the Registrar General information which the Swansea registrar had written him to the following effect;—that he had just registered the death of a man, aged 38, as caused by "exhaustion from fever, probably yellow fever;" that "this "man was landed from a yellow fever infected ship, and died "within three hours of being landed, in one of the dirtiest "courts of Swansea, his death probably hastened by such "removal;" and that "the case had created much excitement "in the town, as several deaths occurred on board the ship "after leaving Cuba, and several of the crew were affected "when the ship was brought into port." On the 26th, I received intelligence from the Registrar General that a death by yellow fever had occurred among the population of Swansea,—viz., that a man, of whom it was stated that he had gone on board the infected vessel soon after her arrival, had died of yellow fever after five days' illness, and that other attacks of yellow fever were reported. Hereupon, under their Lordships' orders, and with the assistance of Dr. Buchanan, as inspector, I immediately took measures to investigate the details of the case, and to advise the local authorities on their management of the danger which had arisen. The very interesting report which Dr. Buchanan made to me at the end of the outbreak is appended in extenso [A]. And I may refer to that report for all details, both as to the ætiological connexion of facts in the case, and also as to the circumstances under which the intentions of the Quarantine Act had been frustrated.

I have said that the outbreak which I have described was, so far as I know, unparalleled in the experience of England. Indeed, anywhere on this side of the Atlantic, yellow fever is a rare phenomenon; and, on the few occasions when it has been epidemic in Europe, even the northmost latitude where it has been seen has been south, and almost invariably much

Yellow fever in 1861 at St. Nazaire.

south, of the southmost latitude of England. Five years ago, however, France was startled, as now England has been, by an outbreak of yellow fever in a latitude where the disease had never before been epidemic—namely, at St. Nazaire, at the mouth of the Loire.* The Lords of the Council, as administrators of the Quarantine Act, had the facts of that occurrence brought before them—facts, in many respects, similar to those of our own outbreak, though the results were more complicated and more injurious. And I propose here to recount these facts; presuming that the liabilities of England in the matter of yellow fever may for practical purposes be deemed identical with the liabilities of St. Nazaire; and contending, therefore, that our Swansea lesson may be made additionally suggestive when studied in the light of that second instance. The story, as I got it from the official communications, was briefly this:—That about June 13 the *Anne Marie*, a wooden sailing vessel loaded with cases of sugar, left Havannah, where yellow fever was epidemic;—that between July 2 and July 12 attacks of yellow fever occurred on board;—that on July 25 she arrived at St. Nazaire, where, "twenty days having elapsed since the last death, and "thirteen days since the last case [attack] of illness," she was admitted to free pratique;—that till the 3rd of August she was being unloaded by labourers of St. Nazaire;—that many of these labourers were, on the 5th and 6th of August, attacked with yellow fever;—that previously (on the 2nd, 3rd, and 4th of August respectively) the mate of the *Anne Marie* who had remained on board, a cooper who had been "employed to repair the cases," and a stone-cutter "who had "been working on the quay near to the *Anne Marie*," had been attacked with illness which, in at least the first two, was believed to be yellow fever;—that, moreover, on August 1, the *Chastan* (which now was at Indret, but previously had been at St. Nazaire lying alongside the *Anne Marie*) had had

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* The latitude of St. Nazaire is about 47° 17′ N., which is some $4\frac{1}{3}$ degrees south of Swansea. The northmost place, where it had ever before been epidemic, in France is, I believe, Rochefort, about 46° N. Portsmouth in the state of New Hampshire of the United States represents, I believe, the northmost latitude at which it has ever been epidemic on the other side of the Atlantic; the latitude, namely, 43° 4′ N.—J.S.

Yellow fever in 1861 at St. Nazaire.

a first attack of yellow fever, and that by August 5, all the five men who formed her crew had been attacked;—that when the place of the *Chastan* beside the *Anne Marie* was taken by the *Dardanelles*, a boy in charge of the *Dardanelles* (the only person on board her) contracted yellow fever;—that the *Cormoran*, which had been taking cargo from the *Chastan* while alongside the *Anne Marie*, had, after some days, two cases of yellow fever on board;—that a steamer of the Lorient Company, having remained two days in harbour near the *Anne Marie*, had, on returning to Lorient, two of her crew attacked with yellow fever; that two lighters from Indret, having also remained two days near the *Anne Marie*, had afterwards their crews, seven or eight in number, attacked with "a kind of half-yellow fever;"—finally, that an eighth vessel, the *Arequipa*, which had also remained for several days near the *Anne Marie*, and had on August 1 sailed for Cayenne, but been detained off the French coast by bad weather till August 5, had on August 5 a first attack of yellow fever, and had other attacks at intervals during the six or seven weeks following. It was alleged, moreover, that while the above events were in progress, certain of the patients, being on shore at St. Nazaire and its neighbourhood, communicated yellow fever to two or three, and slighter illness of the same kind to some others, of the persons who were about them; but, without going here into any minute discussion of these cases, I may state, as the conclusion to which a careful study of the official papers led me, that, in my opinion, it was only in a very qualified sense, if at all, that communication of yellow fever by means of personal intercourse could be said to be proven by the cases.* The

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* "In one very important case (that of M. Chaillon) the sufferer is said not " to have been near the ship, but to have contracted the infection from certain " labourers who came infected from the ship, and whom he attended medically " ['frictioned'] at their homes. In a second case, one of the ship labourers, " who himself had yellow fever, is said to have carried the infection certainly to " his wife, and perhaps to an old man in whose house he and his wife lodged; " for these two had attacks of yellow fever, the old man fatally; and though it " was 'not known as a certainty' by M. Mélier that the old man had not been " near the ship, it seems agreed that the woman had not been there. [H.M. " Consul, Sir A. Perrier, eventually found reason to believe that both these " persons had been exposed to chances of direct infection from the ship.] In

Yellow fever in 1861 at St. Nazaire.

total mischief done by the outbreak was set down at 44 cases of yellow fever, resulting in 26 deaths from the disease. It was stated that, at the time when the *Anne Marie* arrived in port, there was no other vestige of yellow fever at St. Nazaire, or in its neighbourhood; that neither yellow fever nor anything like it had ever before existed in the district; and that no other yellow fever was seen in that summer on this side of the Atlantic. The description given of St. Nazaire was this:—"the town is partly built on the " strand, and is tolerably healthy; its vicinity is marshy, and " subject to intermittent fevers—perhaps more than usually " so this year: nevertheless, nothing uncommon was observed

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" some other cases, persons who apparently had not been near any affected ship, " but had attended patients from the *Chastan*, were attacked, though but " slightly, with symptoms very suggestive of yellow fever. M. Mélier's belief " with regard to the several just-cited cases is, that they were cases of true " contagion, using the word 'contagion' in the sense in which we call smallpox " and typhus contagious. Without pretending to controvert this belief (which " on other grounds may or may not be tenable), I would observe that it is not a " necessary consequence of the facts recorded in the present papers. The facts, " supposing no exception taken to them, would be to this effect:—that labourers " who had spent time in the hold of the *Anne Marie*, and had caught yellow " fever there, carried with them some power of infection; and that a like power, " much feebler in degree, went also with the crew of the *Chastan*. But almost " unquestionably, with regard to the *Anne Marie*, and not improbably with " regard to the *Chastan*, it seems that the ship, irrespectively of sick persons in " it, was a focus of yellow fever infection. And, on this showing, the alleged " facts admit of more than one interpretation. Whether, namely, the men " carried infection because they themselves had contracted yellow fever, or " merely carried infection passively as they might have carried an odour from " the ship; whether men who had laboured in the hold of the *Anne Marie* " without themselves contracting yellow fever there might equally have carried " infection to their homes; whether they who carried infection might have been " disinfected by soap and water and change of dress; whether, in short, the " infective power belonged, not to the sick body, as such, and to its excretions " and discharges, but to the mere washable surface and clothing which had been " saturated with the atmosphere of the ship; this question remains unanswered " by facts in the present record. And I draw attention to that openness of the " question, because of its all-important bearing on the practical issue, whether it " was necessary to adopt at St. Nazaire the system of personal quarantine " which certain of M. Mélier's regulations enforced."—Extract from Office-Memorandum on the St. Nazaire outbreak. See also Appendix, 8th Report. The distinctions which I have drawn as to the mode in which yellow fever might have been (if it was) communicated by personal intercourse at St. Nazaire, and the doubts which I have intimated as to the provenness of true contagion there, are equally applicable to the discussion of the somewhat similar facts which are reported to have occurred thirteen or fourteen years ago at Southampton.—J.S.

"in the state of public health." The weather is said to have been extremely hot—"more like that of a tropical than of an "European climate."

Yellow fever in Northern Latitudes.

Before closing my account of these two little outbreaks of yellow-fever in exceptionally northern latitudes, I ought to state that, though nothing of quite the same sort had previously occurred either in England or in France, yet, in both countries, some slight and almost overlooked warnings, to the same general effect, had been given. Thus, in France, though apparently yellow fever had never touched the ordinary land-population, or spread from ship to ship anywhere so far north as St. Nazaire, probably, on a few occasions, and in very small amount, the disease had been seen in the quarantine establishment of a still more northerly port—that of Brest, attacking now and then some official whose business had been with a newly-arrived infected ship.* Dr. Buchanan's inquiry at Swansea elicited that probably on two or three occasions a solitary case of yellow fever had occurred there under like circumstances. At Southampton too, on one occasion, in 1852, it happened that an engineer of an infected ship was attacked with yellow fever on shore eight days after the ship's arrival in port.† And it is alleged that also at Southampton, in the years 1852–3, the landing of yellow fever patients from infected ships led on three occasions to ill-results, as follows:—that in one case, witnessed by Mr. Wiblin in December 1852, it was believed that a convalescent from yellow fever infected two members of his family, who afterwards infected three others, with illness much less severe than ordinary yellow fever, but having at least some affinity to it; that, in another case, witnessed by Mr. Dusautoy, in the summer of 1853, a woman died with symptoms of yellow fever shortly after having washed the clothes of a seaman who had been landed with that disease; that, in the remaining case, witnessed by Mr. Wiblin in July 1853, it was believed that a yellow fever patient taken to the Southampton poor-house communicated his disease, in a fatal form, to another inmate of the establishment. It is proper to add that, in some of the above cases, medical controversy was raised as to the nature of the disease. Of course no absolute judgment can now be given on questions of fact which so many years ago were in dispute; but, so far as the statements are accepted in proof of the communicability of yellow fever by personal intercourse, the acceptance must be qualified with the same considerations as I have expressed in regard of the corresponding statements at St. Nazaire. In the thirteen years which have elapsed since the occurrences in question, persons, more or less ill with yellow fever, have on numerous occasions been landed at Southampton from West Indian steamers; but in no case, so far as my information extends, has it even been suspected that their disease has spread to other persons. Nor did anything of this kind arise in connexion with the above-mentioned case of the engineer who ran the whole course of his disease in Southampton.

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* Particulars of one such occurrence (which took place in 1856) are given in the Bulletin de l'Académie de Médecine, vol. xxii.—J.S.

† See the case, as reported by Mr. Wiblin, in the Lancet of 1853. I may note here that the ship was a wooden one, and that the engineer, though lodging on shore, had been spending much of his time in the ship. Also I may note that, in our present ignorance as to the incubation-time of yellow fever, we cannot absolutely say that the disease was not latent in the man when he first landed.—J.S.

The various incidents to which the last preceding pages have been given possess in common one particular kind of interest. For when the public mind is troubled with facts or rumours of epidemic visitation, question always arises how far the mischief can be stopped or prevented by restrictions on the ordinary freedom of traffic, national or international. And since the present report records the coincidence of several cases wherein that question was raised, it may be convenient that I here briefly state the principles on which such cases have been considered.

Contagion in its bearings on the Public Health.

When phenomena of pestilence are under popular discussion, and most of all when quarantine is being spoken of, frequently language is used which seems to imply a belief that the medical profession is divided as it were into two camps, respectively of "contagionists" and "anti-contagionists." Now, so far as my knowledge extends, I will

Contagion in its bearings on the Public Health.

venture to say (speaking of course of the medical profession as represented by its acknowledged teachers) that no such duality of opinion exists. That many of our worst diseases acquire diffusion and local perpetuity by means of specific infective influences which the sick exercise on the healthy, is an elementary truth of medicine; and among persons who are competent to distinguish the certainties from the uncertainties of science, there is no more doubt, broadly, as to that truth than there is doubt as to the diurnal and annual movements of the earth.* Ambiguities which fifty years ago existed in respect of some particular cases have since then been gradually cleared away;—sometimes through the ascertainment that seeming contradictions of fact were facts of different diseases confounded under a common name;† sometimes through the new and conclusive evidence of well recorded cases and experiments;‡ sometimes through improved insight into the habits of a morbid poison; § and generally through that better grasp which time has given us of the subject as a whole. And more and more the once chaotic phenomenology of contagion is tending to become an intelligible and consistent section in the great science of organic chemistry.

On the other hand, not even the merest tiro in medicine supposes that contagion (as a morbific power acting from each sick centre) operates equally on all persons, or equally under all varying circumstances of place and time. Differences are

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* In my sixth annual report, when discussing the subject of the spread of communicable diseases in hospitals, I stated with some detail, and need not now again state, the very different conditions under which different diseases are communicated. Vol. II., pp. 150, *et seq.*—J.S.

† Well, for instance, might there be difference of opinion about the communicability of "continued fever," while under that name typhus, typhoid, and relapsing fevers were all spoken of as one disease. So, too, in regard of syphilis, the old uncertainty as to the laws of the contagion depended in great part on confusion between two kinds of chancre.—J.S.

‡ Such, for instance, as those by which the contagiousness of typhoid fever and of cholera has been established.—J.S.

§ As, for instance, in the knowledge which has been got as to the great development of contagious property in choleraic discharges some two or three days after their discharge from the body; or the knowledge of the different effect which one kind of syphilitic inoculation exercises on those who have, and those who have not, previously suffered from a like inoculation.—J.S.

Contagion in its bearings on the Public Health.

obvious even to superficial observation, and such differences become still better appreciated as the general doctrine of contagion gets to be better understood.

First, as regards personal differences of susceptibility;—they are seen, on a small scale, when we observe with what different degrees of severity different persons and different families, in similar external circumstances, and with similar exposures to contagion, suffer the diseases which they thus contract; and, on a much larger scale, the same thing is seen in that permanent and complete insusceptibility which most persons acquire in relation to certain contagia which have once affected them: to small-pox, typhus, and measles, for instance: so that millions of persons who have acquired that kind of immunity are being daily exposed to chances of contagion, but, whatever the quantity of the contagium, and whatever the external circumstances, do not suffer second attacks of the disease which they have once undergone.

Secondly, as the local circumstances vary in which a contagiously-diseased person is placed, so, pari passu, the power of contagion may show an almost infinite range of differences. Typhus and typhoid fevers, for instance, which, amid overcrowding and non-ventilation and refuse-odours and foul water-supply, would develop themselves to be the most spreading of pestilences, will, in thoroughly clean atmospheres and with thoroughly clean water-supply, be so restricted in their infectiveness, that typhoid will scarcely be recognized as contagious, nor even typhus extend beyond limits which admit of being narrowly defined. Again there are certain geological conditions which make the greatest difference (though probably only in an indirect way) to the spread of the diarrhœal infections.* And, even apart from such influences as the above, it seems doubtful whether all contagious diseases are equally capable of pandemic extension:—it is said, for instance, that hitherto neither scarlatina nor typhus has shown much disposition to spread either in Asia or in Africa.

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* This, in relation to cholera, has been more or less definitely observed throughout all the fifty years that the disease has been studied; first abundantly in India, and afterwards in Europe. See Hirsch's Hist. Geogr. Pathologie, Vol. I., pp. 134–146. In 1848–9, when I first had to do with the disease, though but in one city, the fact forced itself strongly on my attention. See reports on sanitary condition of city of London. The subject has much prominence given to it, and is admirably treated in Professor Pettenkofer's contributions to the report of the Royal Bavarian Commission on the cholera-epidemic of 1854.

Contagion in its bearings on the Public Health.

Thirdly, the very important qualification has to be stated, without which no one can bring into an intelligible whole the epidemiology of different lands and different ages of the world, that, in the category of time, far out of human reach, there are circumstances which greatly influence contagion. Any one who will reflect on that most curious branch of natural history which treats of the various plagues which in different times have fallen, sometimes on man, sometimes on his fellow-creatures of the animal or vegetable world, will be convinced that not fixed local conditions, and not mere more or less of international traffic can, either singly or conjointly, explain the wonderful fluctuations of effect. When the ordinary distribution of human disease on the surface of the globe is studied, it is easy to distinguish certain spaces, of larger or smaller area, within which certain well-marked forms of disease appear as though they were native to the soil: where the local pathology is almost as definite as the local flora: but while some such diseases remain, so far as we know, permanently limited to places where they are endemic, others of them have once or oftener spread widely from their respective centres, have tended to general diffusion on the earth, and have then again retired within their former limits. Again, there are diseases, to which we cannot assign any definite local birthplace, but which, sometimes of prominent interest, and sometimes almost or quite lost to observation, are present on the earth's surface at different times in vastly varying quantities. Now, subject to qualifications of detail, it seems generally unquestionable that the diseases which in one or other of those ways immensely vary from time to time in the quantity of their known existence upon

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The bearing of the geological influence, however, is apparently none but this:—that where populations are living in certain geological conditions, there, unless engineering science have supplied artificial drainage and water-supply, the local atmosphere and drinking-water will almost certainly be much polluted by those fæcal impurities amid which the diarrhœal contagia are peculiarly apt to multiply.—J.S.

Contagion in its bearings on the Public Health.

earth, are diseases which human intercourse can spread; and doubtless there are cases where quantitative differences of intercourse can be deemed a sufficient explanation of the quantitative differences of disease. No one, for instance, can doubt but that the changed relations of the two halves of the world after the discovery of America were enough to account for the subsequent dreadful sufferings of America by small-pox, and rendered plausible the hypothesis that the old world got syphilis from the new. Nor—to take a minor and collateral illustration, needs any one go farther than to the changed circumstances of our cattle-traffic within the last few years, in order to explain why the phenomenon of steppe-murrain infection is now again seen in England after an absence of more than a century. But not all the cases in question admit of such facile explanation. Thus,—for what reason it is that Asiatic cholera, during the last half-century, has had certain definite fits of pandemic extension, and has three times been exceedingly fatal in Europe, where previously it had been unknown or was forgotten; or why diphtheria, which scarcely had had a place in history till it overran Europe in the 16th century, and which since then had but rarely been spoken of, has for the last ten years been an important disease in England; or why the plague of the Levant has within the last century or two become an almost obsolete disease; or why the yellow fever of the tropics has in particular years raged furiously in parts of Europe; or why our black death of the 14th century, now not extinct in India, has never but once been in Europe; or what has become of our sweating-sickness of three centuries ago;* or whence has come the modern importance of

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* The English sweating-sickness was first seen in 1486, when, as a disease previously quite unknown, it started apparently from somewhere in Wales. A second epidemic of it came in 1508; a third in 1518, when it spread from England to the French coast; a fourth and most severe in 1529, when it spread from England over great part of the continent of Europe; and a fifth in 1551. The disease then entirely vanished. A century afterwards a new disease (which has been known down to our times, chiefly in France, as miliary fever, or *la suette*) somewhat resembling the old English disease, but also with definite differences from it, sprang up as suddenly at Leipzig as Ovid's famous Nereid in Ortygia. And that disease, familiarly as it is known in France, is, I believe, unknown in England.—J.S.

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cerebro-spinal meningitis;—these are questions which, even separately, but most of all when considered in their mutual connexion, are seen to admit of no explanation from a merely biological basis. The student must enlarge his view to regard the chemistry of the surface of our globe as subject to variations, perhaps definitely progressive or cyclical, in which human epidemics are but a part. If popular pathology, working on its few local facts, sees something of this in the "unhealthy seasons" which arise in exceptional circumstances of rain-fall and temperature: if some such "atmospheric" influence must be invoked to explain, even for a single climate, the fluctuating fatality of the most ordinary of zymotic diseases:* if, as recent researches render probable, the variations of typhoid fever in a single town cannot be

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* Table showing the Number of Deaths in England from each of certain Zymotic Diseases in each of the 23 years for which the record has been made.

Years.	Scarlatina.	Diphtheria.	Measles.	Hooping Cough.	Smallpox.	Fever.	Diarrhœa, Dysentery, and Cholera.
1838	5,802	—	6,514	9,107	16,268	18,775	3,440
1839	10,325	—	10,937	8,165	9,131	15,666	3,493
1840	19,816	—	9,326	6,132	10,434	17,177	4,799
1841	14,161	—	6,894	8,099	6,368	14,846	4,198
1842	12,807	—	8,742	8,091	2,715	16,201	7,622
1847	14,697	—	8,690	9,260	4,227	30,994	15,630
1848	20,502	—	6,867	6,862	6,903	22,037	15,604
1849	13,111	—	5,464	9,615	4,645	18,347	74,155
1850	13,370	—	7,080	7,770	4,666	15,375	14,400
1851	13,594	40	9,370	7,905	6,997	17,930	18,045
1852	18,813	74	5,846	8,022	7,320	18,641	21,754
1853	15,653	46	4,895	11,200	3,151	18,554	20,502
1854	18,325	203	9,277	9,770	2,808	18,893	42,092
1855	17,128	186	7,354	10,185	2,525	16,470	15,044
1856	13,951	229	7,124	9,225	2,277	16,182	15,912
1857	13,919	310	5,969	10,138	3,936	19,016	24,037
1858	25,481	4,836	9,271	11,648	6,460	17,883	16,004
1859	9,907	9.587	9,548	8,976	3,848	15,877	20,597
1860	9,681	5,212	9,557	8,555	2,749	13,012	11,185
1861	9,077	4,517	9,055	12,309	1,320	15,440	20,999
1862	14,834	4,903	9,800	12,272	1,628	18,721	12,667
1863	30,475	6,507	11,349	11,275	5,964	18,017	16,801
1864	29,700	5,464	8,323	8,570	7,684	20,106	18,366

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understood without reference to the varying water-level in the local soil, and to the physical and chemical consequences of its alternate rises and falls:* much more is the truth to be appreciated when the field of consideration widens to the epidemiology of the world, and especially when the great pestilences are regarded which have made epochs in human history. Those almost explosive arisings or spreadings of disease are facts of cosmo-chemical disturbance which no mere contagionism can explain. The powers by which such disturbances may be made, the nearer and remoter influences which may vary chemical transformation upon the earth, are hitherto, perhaps, rather guessed at than known; but it seems probable that the so-called caprices of epidemics will never be adequately explained till the interpreter has for his context a true knowledge of those cosmical influences, and of the "caprices" to which they too are subject.

I have dwelt on the above qualifications in order that I may not be misunderstood in the remarks which I am about to make, doubtless in the contagionistic point of view, on the foreign diseases which came under consideration in 1865. Of these, for my present purpose, cholera is infinitely the most important. Cerebro-spinal meningitis, if diffusible by human intercourse, is not so in a high degree. Yellow fever (apart from other considerations concerning it to which I shall hereafter advert) may at present be assumed to have

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* I refer particularly to a paper by Professor Buhl, in the first volume of the *Zeitschr. der Biologie,* and to a corroborative paper by Dr. Seidel in a later part of the same volume, on the relations of typhoid fever in Munich to the fluctuations of water-level in the wells of the city. These papers, however, only represent, with regard to typhoid fever, the continuation of a line of study which had been opened with regard to cholera by Professor Pettenkofer of Munich; whose many valuable contributions to the science of cholera deserve the most grateful acknowledgments from all who are interested in the subject. According to this author, the best soil for cholera is a porous soil, easily penetrable by air and water, and in which water is to be found not far below the surface, and which is foul with excremental matters; and the times when such a soil is aptest to multiply cholera-contagium are times when the water-level in it is falling after having reached an unusual height. The degree in which a given cholera-contagium, when imported, produces epidemic results is, according to Professor Pettenkofer, essentially determined by the degree in which its importation coincides with the fulfilment of those two conditions of place and time.—J.S.

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little or no tendency to spread in this country. But with cholera the case is different. Not disregarding the qualifications which I began by setting forth: not asserting that the mere uniform influence of contagion would account for the several fitful spreadings of cholera from the East; not ignoring that the power of the cholera-contagium in our climate varies almost infinitely according to local circumstances, and specially according to those circumstances which regulate the distribution of typhoid fever: I yet, for public health purposes, deem it quite essential to insist on the evidence which is now accumulated in all the archives of European Medicine, attesting the contagiousness of cholera.

The doctrine on this subject which in my opinion deserves, in the present state of knowledge, to be accepted as practically certain—sufficiently certain, I mean, to be made the basis for precautionary measures, may be stated in the following propositions:—that, when cholera is epidemic in any place, persons who are suffering from the epidemic influence, though perhaps with only the slightest degree of diarrhœa, may, if they migrate, be the means of conveying to other places an infection of indefinite severity; that the quality of infectiveness belongs particularly, if not exclusively, to the matters which the patient discharges, by purging and omitting, from his intestinal canal; that these matters are comparatively non-infective at the moment when they are discharged, but subsequently, while undergoing decomposition, acquire their maximum of infective power; that choleraic discharges, if cast away without previous disinfection, impart their own infective quality to the excremental matters with which they mingle, in drains or cesspools or wherever else they flow or soak, and to the effluvia which those matters evolve; that if the cholera-contagium, by leakage or soakage from drains, or cesspools, or otherwise, gets access, even in small quantity, to wells or other sources of drinking-water, it infects in the most dangerous manner very large volumes of the fluid; that in the above-described ways even a single patient with slight choleraic diarrhœa may exert a powerful infective influence on masses of population among whom perhaps his presence is unsuspected; that things, such as bedding and clothing, which have been imbued with choleraic discharges, and not afterwards fully disinfected, may long retain their infectious properties, and be the means of exciting choleraic outbreaks wherever they are sent for washing or other purposes.

Precautions against Contagion.

The precautions, generally, which may be taken against contagious diseases are of two kinds:—first, if possible, to prevent the entrance of the contagion;—secondly, if the contagion be present, to annihilate as far as possible the circumstances which favour its spread.* And thus, as regards cholera, a first and incalculably important question to be answered by those who have to care for the public health of a country, is the question whether, by any measures of quarantine, they can provide that all contagion of the disease shall be kept outside the limits of their land.

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Subject to one qualification, which is not an important one for the present argument, it may, I think, be accepted as certain that quarantine, conducted with extreme rigour, and with the precision of a chemical experiment, will keep cholera out of any part of Europe in which the extremely difficult conditions can be absolutely fulfilled;† and thus, if I speak

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* To the above-mentioned two kinds of precautions may be added, with regard to many important cases, a third, as follows:—So far as practicable, not to bring into personal relation with the sick, as attendants or otherwise, any persons who have not before acquired, or probably acquired, an insusceptibility to the existing disease. In typhus-epidemics, for instance, economies of valuable life may often be made by preferring for employment as nurses, doctors, inspectors, and so forth, persons who have already once had typhus. The same principle applies to many other contagious fevers; but I have no evidence that it in any degree applies to cholera. If I mention yellow fever in this note, it is not with any intention of classing it as a contagious fever in the sense in which typhus is contagious; but, as the same principle of conduct is involved in both cases, this may be a convenient place for observing, that when yellow fever is epidemic in districts, persons to be sent into those districts ought, as far as possible, to be only persons who have already had that disease.—J.S.

† The qualification with which the above opinion is guarded relates to the uncertainty how far the mysterious influence which starts, and perhaps accompanies, each pandemic extension of cholera, is an influence which creates new centres of "spontaneous generation" for the disease. As regards Europe, there seem to be strong presumptions against the likelihood that any such new centres are created. But this negative cannot be deemed absolutely certain; and of course the qualification becomes more and more important, in proportion as the country to which the question applies is near to those countries where cholera first had its beginning.—J.S.

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to the dry question of medical practice, I have no hesitation in saying that England ought to resist cholera by quarantine. On the other hand, though I cannot pretend to discuss with any kind of authority the non-medical aspects of the question, it would be mere pedantry for me to ignore that facts which are of common notoriety, and considerations which are of common sense, conflict with that medical conclusion. A quarantine which is ineffective is a mere irrational derangement of commerce; and a quarantine, of the kind which ensures success, is more easily imagined than realised. Only in proportion as a community lives apart from the great highways and emporia of commerce, or is ready and able to treat its commerce as a subordinate political interest, only in such proportion can quarantine be made effectual for protecting it. In proportion as these circumstances are reversed, it becomes impossible to reduce to practice the paper plausibilities of quarantine. The conditions which have to be fulfilled are conditions of national seclusion; and the fulfilment of such conditions by England would involve fundamental changes in the most established habits of the country.

In order to illustrate this view, the medical postulates of quarantine deserve to be considered in detail. Quarantine, purporting to be effectual, cannot rest satisfied with excluding from entry such persons as are obviously sick, but, indispensably for its purpose, must also refuse to admit the healthy, till they shall have passed in perfectly non-infectious circumstances, at least as many days of probation as the disease can have days of incubation or latency;—this condition often involving as its consequence that, if one case of disease arise among a number of persons in quarantine, the whole number of apparently-healthy must recommence their period of probation, and this perhaps again and again. Now, setting aside, as not essential to quarantine, the cruelties which its maladministration involves, and which in practice are almost identified with its exercise: criticising only the conditions which quarantine, if it is to be effective, must involve: and, for the moment, not even counting as an objection the cost of that gigantic establishment which has to be permanently

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maintained in order to meet occasional exigencies: I here insist only upon the restrictions.* Considering what they, when really carried into effect, must involve—what inconvenience to persons, what interruption to commerce, and on how vast a scale, and for what indefinite duration of time, no one can expect, in regard of great trading communities, that governments, if they go so far as to enact, will have much success in enforcing, quarantine. Against the efficiency of it, when enacted, there operate some of the strongest of all law-breaking influences; on the one hand, instincts of contempt for the narrow self-protectiveness which it represents, and, on the other, those eager commercial interests which now mainly govern the world. The latter, in proportion as they are affected, elude the restrictions which would embarrass them. Contraband of quarantine, like ordinary smuggling, is developed as soon as the inducements for it are considerable. And thus, practically speaking, where great commercial countries are concerned, it can scarcely be dreamt that quarantine-restrictions will be anything better than elaborate illustrations of leakiness.

In respect of England, moreover, there are other facts to be stated. In 1832-3, when some sort of quarantine against

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* It may be convenient to consider the restrictions in some detail, and with cholera to illustrate their bearing. The incubation-time of cholera, in the strict medical sense of the words—*i.e.* the time which elapses between the moment of infection and the moment when critical inquiry may first discover an altered (though perhaps but very slightly altered) action of the bowels, may be not more than two or three days; but practically the incubation-time of the disease must be regarded as of much longer duration—as continuing, namely, till the symptoms are so far developed that the sufferer cannot overlook or disguise them; and this point in the progress of the disease may not be reached till the first slight looseness of bowels (which many persons would overlook or deny) has continued for many days, or, it is said, even for weeks. If for the purposes of the argument we assume that an allowance of ten days will cover the time during which infection can be latent or designedly concealed: which, however, is less than the time on which quarantining governments insist, and, I believe, only half the time of an average quarantine in Greece: and if we translate into practical language what this would mean, if England had quarantine against the continent: it would be, that ten days would be the minimum time in which any person, sick or healthy, could enter England from the continent—that, for instance, our present ninety minutes between Calais pier and the Dover railway-station would become an affair of at least ten days, and that no national advantage from quarantine could be promised, if this rule were in any single case relaxed or evaded.—J.S.

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cholera was adopted here, the results gave no encouragement to a repetition. Then followed the erroneous belief (which subsequent better knowledge has corrected) that the spread of cholera is unaffected by human intercourse. Under these and other influences the thought of quarantine in England became more and more obsolete, and the possibility of enforcing it, if ever so much desired, fell more and more towards nothingness. Probably there was the practical conviction that, against any contagious disease current on the continent of Europe, quarantine, of the utmost strictness which England could hope to attain, would not give results worth the sacrifice. I daresay that quarantine in England was never otherwise than very lax. And at all events for many years past it has, in every medical sense, been abolished. Also with its virtual extinction, the establishment for giving it effect has declined. As successive governments advanced further and further in relinquishing what probably at its best was only a sham of quarantine, corresponding reductions of establishment were made. And the result of the entire process may be told in these very few words,—that, at the present moment England has not in readiness the means of properly quarantining even a single ship.* It is not for me to say that this state of things may be deemed final. But if reversal of the policy which it expresses were ever so much desired, it could not be effected off hand. Enormous first expenditure of money in creation of proper lazarets would be wanted, as well as subsequent very large annual outlays for maintaining the necessary establishments. And the time which would be required for bringing the organization into work forbids the supposition that this could ever be done on emergency.

So, for England, under present circumstances, quarantine against cholera, as existing in the countries which are nearest to us, is a precaution of which there can be no serious thought. Were the country ever so ready to endure those extreme

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* It may be proper to mention that the ceremonies to which, under the name of quarantine, certain trans-atlantic ships are subjected, on their arrival in this country, have not, properly speaking, any medical significance in relation to this country, but are part of an international obligation contracted for commercial reasons.—J.S.

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restrictions without which the whole thing is fruitless and absurd, the means for imposing them do not exist*. To extemporise a *cordon sanitaire* is simply and totally impossible; and no partial quarantine can be relied on for national purposes. Not only as regards cholera, but generally as regards all contagious disease, the position, which now has to be recognized and dealt with, is—that contagions current on the continent of Europe must be deemed virtually current in England.

Imperfect state of our sanitary law and administration.

Having regard, however, to our entire unprotectedness by quarantine against any contagions which may threaten us from abroad, I feel it additionally incumbent on me to insist on the present very imperfect state of our sanitary law and administration. Especially in view of the present re-infection of Europe by Asiatic cholera the necessity for a better state of things seems to me of the most urgent kind.

On the one hand I would beg leave again to refer to the evidence which is summed up in my last report, and is corroborated by new instances in the present one, as to the very extensive inoperativeness of the Nuisances Removal Acts in England.

And on the other hand I would refer to the observations which conclude my letter [A] addressed to the Lord President in April last, on the powerlessness of local authorities in regard of certain dangers of contagion. The footing on which the country now stands in relation to foreign

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* When cholera last year broke out so vehemently at Alexandria, and was hitherto not in Europe, it would have been, comparatively speaking, a trifle to quarantine arrivals from that one port; not only because of their being few, in comparison with the innumerable arrivals from the ports of continental Europe, but also because, with the long voyage, the object of quarantine would generally have accomplished itself before arrival. And medically, of course, such a precaution was to be desired. But while my Lords still had it under consideration, whether to establish this amount of quarantine, and to provide the means of conducting it, cholera had already almost ceased at Alexandria, and had shown itself in other various ports. Before proper quarantine arrangements against Alexandria could have been organised, no quarantine would have been self-consistent which had not been a quarantine against France, Turkey, Spain, Italy, and Germany, as well as against our own possessions of Malta and Gibraltar; and doubtless the contagium of cholera was in Southampton long before any effective arrangements could have been called into existence for excluding it. —J.S.

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contagions is, I apprehend, this:—that they have to be dealt with like our ordinary home-bred contagions; that, for preventive purposes, no action, or at least no effectual action, can be taken by the general executive of the country; that, so far as any good is to be got out of proceedings directly against contagion, this, like the good of indirect proceedings, has to be sought in the vigour of local authorities. It therefore becomes quite essential that the position of local authorities generally, in regard of contagion, should be reviewed. As to contagions already current in the country, practically any diseased person scatters his infection broadcast almost where he will—typhus or scarlatina, typhoid or small-pox, or diphtheria; and, under present circumstances, if cholera were in a district, the patient with choleraic diarrhœa would form no exception to the general licence. I cannot say that the exceptional case of the foreign infection seems to me of more importance than the every-day case of our native diseases; but I would venture to submit that, with regard to both classes indifferently, the present unlimited licence seems urgently to demand restriction. As in the case of typhus or typhoid, so also in the case of cholera: or, to use one general description, in the case of any dangerous contagious disease: the local authority, I submit, ought to have the power of requiring from the diseased person that, in regard of residence and otherwise, he shall so conduct himself as not unnecessarily to multiply the chances of extending his infection to others. Subject to the condition that proper hospital-accommodation can be offered, the authority ought to be able to enforce, in regard of any dangerous contagious disease, that the sufferer should not be in circumstances which promote the spread of disease to the general population. This power, exercised in seaport towns in relation to the poorer classes who might arrive infected from abroad, would in effect work thus:—such persons would be debarred from resorting to the common lodging-houses and crowded tenement-houses of the town, and would (as much to their own advantage as to that of others) be constrained to go to the local hospital, there to remain till cured. How far such a power for local authorities would be delegable to them under the Quarantine Act,

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or would require special legislation, is perhaps not a question of any ultimate importance, and is one which I am not competent to discuss. It deserves notice, however, that if the power in question were vigilantly used by local authorities, and in conjunction with other sanitary powers, its exercise would not of necessity be only of local effect, but might under some circumstances contribute, even importantly, to those national purposes which quarantine is intended to accomplish.*

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* For obvious reasons it is only to a small extent that legal restrictions can avail to prevent the spread of such contagions as are once current in the country. They can only apply to conduct by which the public health is manifestly and directly endangered, and not to all kinds of such conduct. But in proportion as the physiology of contagion gets to be better understood by the public, the influence of legal restrictions will be increased by the appeals which well-informed persons will be able to make, and to which the example of such persons ought to give force, against all reckless conduct in such matters. Conditions of lodgment, as discussed in the text, are not all that require consideration. Complaints are often made of the freedom with which persons imperfectly convalescent from contagious fevers (as, very notably, from smallpox) expose themselves in places of common resort, and a careless sending of sick children to school often does much to spread diphtheria, scarlatina, and other contagious diseases; the careless transmission of infected things to common laundries, and of course the traffic in infected rags, imply dangers of the same sort; and against all such sorts of action the public ought to have some ready means of protecting itself. So, too, as regards the use of public carriages by persons contagiously diseased: no doubt a proper organisation for the conveyance of sick persons ought to form part of the medical relief arrangements of every large town, and the use of the common public carriages ought then to be forbidden: but if, as often happens in our present circumstances, persons who have smallpox and other dangerous contagious diseases cannot be taken to hospital except in common street cabs, surely the subsequent disinfection of every such carriage might be insisted on. Other dangers are for personal, rather than municipal, precaution. For instance, the modes by which puerperal fever is spread, and the extreme and fatal sensibility of puerperal women to the contagion of scarlatina, are matters which require, both generally from the public, and specially from persons who visit from one sick room to another, far more thought than is yet given to them. Here also, I may observe, for the consideration of those whom it concerns, that our new institution of Turkish baths, used in common by swarms of persons—by some more or less for health, but by numbers also for mere enjoyment or curiosity, involves (inter alia) some awkward chances of syphilitic contagion: indeed, Turkish baths are now among recognized means of treatment for persons with constitutional syphilis, who, in some cases, have local symptoms by which the disease can be communicated: and the question whether such patients take the general run of public baths, and are among the numbers who nakedly occupy the seats and couches of common sweating-rooms, is one which may greatly concern other frequenters of such establishments.—J.S.

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Essentially different from the danger which attends the migration of persons affected with cholera or its premonitory symptoms, is the possibility, illustrated by the Swansea experience of last October, that ships infected with yellow fever may introduce that infection into England. I do not pretend to say that yellow fever is absolutely non-contagious in this country: non-contagious, I mean, in the sense in which typhus and small-pox are contagious: much less do I pretend to say that it is absolutely non-contagious in climates hotter than our own. This doctrine, however, even in the extremest form in which it can be stated, is not only held by many persons of high authority who have studied the disease in its trans-atlantic strongholds, but is certainly rendered extremely probable by facts which we have observed in Europe. When Lisbon, in 1857, was being so terribly scourged by yellow fever, thousands of its population fled far and wide into surrounding districts; among those who thus fled, numbers were already incubating the disease, and of course fell with it in their respective places of refuge, more or less distant from Lisbon; in 182 cases of this description, the Portuguese Government caused inquiry to be made whether persons about the sick fugitive had shown any signs of the infection; and the answers were, that in no single case had this occurred. So again, in our Swansea experience, nothing like personal contagion seemed probable. And though undoubtedly at St. Nazaire there were a few facts which led M. Mélier to impute contagiousness to the disease, the overwhelming majority of facts pointed, even there, to an opposite conclusion, and suggested that in the exceptional instances some source of fallacy had been overlooked. Quite unquestionable, however, is the evidence that the infection of yellow fever accompanies marine traffic from land to land; and in proportion as the belief is untenable that the disease is personally contagious, in such measure the alternative must be accepted—that infectiveness is in the body of the ship. That yellow fever is a malarious rather than a truly zymotic disease, is a disease of the nature of ague rather than a disease of the nature of typhus,—that the ship which spreads infection does so

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irrespectively of the persons who are in it, whether they be healthy or diseased,—that the ferment of a local and impersonal infection clings to the ship from shore to shore, and breeds new malarious action in any congenial soil to which it comes,—that the exceptional and contingent power of persons to spread the disease is generally but a very scanty and transient power, not belonging particularly to the sick, but to the healthy in common with them, attaching perhaps mainly to their dress, and equally predicable of all absorbent things which the atmosphere of the ship has imbued ;—this, it seems to me, is the doctrine of yellow fever which tallies best with our present knowledge of facts. Without pretending to dogmatise theoretically on a subject which no doubt has its difficulties, I am strongly of opinion that preventive measures based upon that doctrine are, under present circumstances, amply sufficient for the practical purposes of this country. If it were, as far as practicable, provided that, during summer weather, ships which might reasonably be suspected of yellow fever infection should not come into close relation with shore or with other shipping till they and all things in them which might carry infection, had undergone thorough disinfection, this, in my opinion, would probably suffice to prevent in future any such unfortunate occurrence as the late outbreak of yellow fever at Swansea. I append as bearing upon this suggestion [A] the regulations which were put in force by the French government on occasion of the disaster at St. Nazaire, and therewith the remarks which I submitted to the Lords of the Council on the question of the applicability of such regulations to this country. It will be observed that the suggestion which I have just given corresponds in principle to one large part of the French regulations. And there is not, in my opinion, any present reason for supposing that England would get additional security by adopting against yellow fever the system of personal quarantine which other of the French regulations enforce.

APPENDIX.

LETTER addressed, April 19th, 1865, to the LORD PRESIDENT of the COUNCIL, by the MEDICAL OFFICER, on certain EPIDEMICS prevailing in the NORTH of EUROPE; with Supplementary Memorandum on EPIDEMIC CEREBRO-SPINAL MENINGITIS.

Certain Epidemics prevailing in the North of Europe.

My Lord, Whitehall, April 19, 1865.

I have the honour of reporting to your Lordship that the information which, under your directions, I have been receiving during the last fortnight, on the subject of certain diseases prevailing, or said to be prevailing, in the North of Europe, is now so far completed by a telegram yesterday received from Dr. Whitley at St. Petersburg, as to render possible a judgment, which I think may not be premature, on the very important question, whether this country, in its intercourse with the North of Europe, is exposed to more than its ordinary risks of being infected by disease.

The very alarming rumour which excited your Lordship's vigilance on the present subject, was to the effect that a disease of the nature of plague, coming from beyond the Ural Mountains, and causing depopulation in its course, had not only reached St. Petersburg, where it was said to be causing fearful ravages, but had spread beyond the Prussian frontier, and was prevailing, though in a less destructive form, at Dantzig and various other places in North Germany.

Telegraphic inquiries, however, which Earl Russell at your Lordship's request caused to be made of Her Majesty's ambassadors and consuls in the countries to which the rumour referred, led almost immediately to the establishment of two facts, which, while they fully accounted for the existing rumour, divested it in great part of its extremely alarming character. In the first place it was ascertained, that, though undoubtedly St. Petersburg was suffering a very great excess of sickness and mortality, yet at least the main part of the epidemic disease which was prevailing there consisted only of such fevers as are well known in this country. And in the second place it was ascertained, that, though a very frightful disease was indeed prevailing in parts of North Germany, and particularly about the Lower Vistula, this disease was altogether different in kind from the fevers which were prevailing in St. Petersburg. In proportion as time has permitted the ordinary postal communications to take place, the above-stated two facts have been established in more and more detail. And it may now, I think, be fairly assumed that there is no other important fact to be added to them.

First, as regards St. Petersburg,—the epidemic which is prevailing in that city consists of two forms of fever which are known in this country as *relapsing fever* and *typhus.* Of relapsing fever (which also, from the circumstances under which it prevails, is familiarly known by the name of *famine-fever*) we have had no large experience in this country since the years 1846–48, when, in consequence of the Irish distress, the disease first became epidemic in Ireland, and next raged in Liverpool and many other of our chief towns to which its contagion was brought by Irish immigrants. Typhus, on the other hand, is probably never absent from among us. During the last two or three years, there has been an almost unprecedented amount of it in London, and, as your Lordship is aware, inquiries relating to very large epidemics of it in Liverpool, Greenock, and Bristol have during the last few months been required of the Medical Department of the Council Office. In times when relapsing fever prevails (and always they are times of national scarcity) typhus always or nearly always co-exists

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with it. It was so at Liverpool in 1847, it is so at St. Petersburg at present. The mixed epidemic, wherever it occurs, testifies to the miserable state of a starving and over-crowded proletariat; and there seems reason to believe that, if the St. Petersburg epidemic is of more than common severity, this is only in result of extremely aggravated conditions of privation, over-crowding, filth, and district-unwholesomeness, operating on large masses of the lowest population. It is probable that the relapsing fever has caused particular alarm in St. Petersburg from the fact that the disease had never before prevailed there, nor indeed been much known anywhere in Russia. But it is a disease greatly less dangerous than typhus. To persons whom they respectively have attacked in this country, typhus has been seven or eight times as fatal as relapsing fever.

Both typhus and relapsing fever are communicable from person to person by means of the general exhalations of the sick; and the danger of such contagion acquires its utmost development when masses of ill-fed population are crowded together in places which are insusceptible of ventilation.

It seems probable that the fevers now prevailing in St. Petersburg are not only extensively diffused, but, in their respective kinds, are of fully average severity. The relapsing fever is causing more than its usual proportion of deaths, and is notably attended with those inflammatory swellings which are known by the name of buboes. Although the reports which are before me do not state the relative frequency with which the latter symptom is observed, yet, from the fact of its being mentioned in a very general report on the epidemic, I infer that it has been more than commonly frequent, and doubtless it was from this circumstance that there arose the rumour of plague. It is therefore requisite to mention that buboes are by no means exclusively characteristic of plague, that severe typhus in this country is not very infrequently attended by them, and that also in our other forms of fever they are sometimes, though far less frequently, observed. The great importance, however, of the question which is involved in that symptom of buboes was a main reason for your Lordship's thinking it desirable to have an English physician's report on all the elements of the St. Petersburg epidemic; and it was therefore that under your Lordship's orders I instructed Dr. Whitley to proceed to St. Petersburg for the purpose of making personal examinations in the matter. He arrived at St. Petersburg on Saturday night last, and his telegram which I yesterday received informs me in positive terms that "nothing resembling plague has been observed."

As regards the disease which is prevailing in parts of North Germany, the case is very widely different. That disease is one of which hitherto England has had no general experience. Even in foreign medical literature mention of it is but comparatively recent, and the knowledge which relates to it is incomplete. It is a febrile nervous affection of a very painful and very dangerous kind. By us, for practical purposes, it may be regarded as a new disease; but, in truth, it has, for the last twenty-eight years been prevailing very extensively in successive small epidemics, both in Europe and in America, throughout the entire breadth of the north temperate zone. Having regard to the probability that sooner or later this disease may show itself in England, I have thought it convenient that, both for your Lordship's present reference, and for such further use as you may deem expedient, there should be compendiously stated the main facts which are yet known with regard to the disease's nature and laws of distribution; and I have accordingly prepared a special memorandum in which, by reference to foreign authorities, I endeavour to fulfil that object.

Both on account of the alarming rumours which were connected with the present epidemics in North Germany, and also with a view to collect the latest

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and fullest information concerning the habits of so important a disease, your Lordship (as in the case of the St. Petersburg fevers) deemed it right that an English physician should be sent to observe and report; and, under your Lordship's orders, I instructed Dr. Sanderson to proceed for this purpose to those places about the Lower Vistula where the disease was chiefly prevailing. From him, during the last few days, I have received telegrams and letters which leave no doubt as to the identity of the prevailing disease, and establish, as I have already stated, that it has no dependence on the fevers of St. Petersburg.

In the special Memorandum to which I refer, I have stated what I can learn with regard to the communicability of the nervous disease. Your Lordship will observe that, though I hesitate to speak of the disease as incommunicable by personal intercourse, I show reason for believing that under ordinary circumstances it is not thus communicable in more than a very low degree. And Dr. Sanderson writes to me, in relation to the present epidemics, that he finds "no reason for regarding the disease as personally communicable;" that he has "met no single instance in which more than one member of the same family "has been attacked; nor has there been any diffusion of the disease in any of "the hospitals."

From the foregoing statement, your Lordship will have gathered that, neither as regards the fevers which are present in St. Petersburg, nor as regards the nervous disease which is occurring in North Germany, are the circumstances such as have on former occasions led to the adoption of quarantine by this country;—that, as regards the importability of the nervous disease, our danger in communicating with the Baltic ports (unless there were movement of masses of infected population) is apparently nothing, or next to nothing;—and that, as regards the Russian epidemic, our danger in communicating with St. Petersburg is only the same sort of danger as the several parts of the United Kingdom have often occasioned to one another, and are even at the present time, as regards the worst known forms of fever, daily and abundantly occasioning.

As, however, it is possible and even probable that, with the re-opening of the Baltic navigation, ships which come to our ports from Russian territory may occasionally have fever-cases on board, it is essential that, in places which this danger may affect, the local sanitary authorities should exercise peculiar vigilance against all those unwholesome conditions which favour the propagation of such disease. In this connection I would beg leave to advert to the short general Memorandum which, under direction of the Lords of the Council, I prepared in 1860, and have since then been in the habit of circulating, on the "Proceedings which are advisable in Places attacked or threatened by Epidemic "Disease." As regards the class of places to which my present remarks particularly apply, it is scarcely needful to observe that the state of common lodging-houses, and of houses which are sub-let in several small holdings, ought very specially to be seen to, and that every possible care ought to be taken to provide lest they be left over-crowded and ill-ventilated. Except in connection with reckless personal association, there is little danger that febrile contagion will spread widely where the sanitary circumstances are good; but the advent of any such contagion into the poorer dwellings of a place tests, in a crucial and unflattering way, the sufficiency of their adaptation to health.

Finally, with reference to the just-mentioned danger, and to others of a like kind, it seems imperative on me that on this occasion I should bring under your Lordship's particular notice the very unsatisfactory state of our sanitary laws in everything which relates to the migration, exposure, and housing of persons who are infected with the current contagions of the country, and who, in the absence

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of proper precaution, must communicate their disease to others. Complaints are frequently made that the public health of a district is seriously endangered by the arrival (sometimes from abroad, sometimes from other parts of the United Kingdom) of patients suffering with small-pox, typhus, typhoid fever, scarlatina, or some other malignant and more or less communicable disease; or that such patients are being lodged in houses where the disease can hardly fail to spread; or that, either in states of imperfect convalescence, or even during active disease, they travel in public conveyances or expose themselves in places of common resort. In the present state of the law the authorities who are charged with the local protection of the public health are practically almost powerless against these evils; and it would be over-sanguine to imagine that, within any small number of generations, the sanitary state of the poorer dwellings of the country will be generally such that the germs of contagious disease can with impunity be imported into them. I would therefore venture to submit to your Lordship that in my opinion it deserves the consideration of the Legislature, whether the hands of local authorities might not expediently be strengthened against the evil which I have described; whether, namely, such authorities might not, under proper qualifications, be empowered to require that persons who come with dangerous communicable disease into the district should so dispose themselves, in regard to lodgment and seclusion, as not, in any fairly avoidable degree, to endanger the public health.

I have the honour to be,
My Lord,
Your Lordship's most obedient servant,
(Signed) John Simon.

Memorandum relating to the Disease which is now epidemic in parts of North Germany.*

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The disease which is now prevailing epidemically about the Lower Vistula and in some other parts of North Germany, belongs apparently to the class of specific Fevers. It has for its distinguishing mark, that it involves an acute inflammatory affection of the great nerve-centres of the body—the brain and spinal cord. After death its traces are obvious to the anatomist in morbid structural states of those organs, chiefly of their surfaces and enveloping membranes; and it is from the characteristic affection of these membranes (the so-called "meninges" of the nervous centres) that the disease has got its technical name of *cerebro-spinal meningitis.* Specially in cases which have proved fatal otherwise than with extreme suddenness, the characteristic change is commonly found advanced to a degree in which it cannot well be overlooked; and, more or less generally throughout the cerebro-spinal system, the *pia-mater* (that delicate vascular membrane which is folded close about the nervous centres and their dependent nerve roots) is found in a swollen and infiltrated, or perhaps suppurating or disorganised state. For practical purposes, this state of the covering membrane of the nervous centres may be regarded as a mere index of

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* Statements of fact in this Memorandum are for the most part founded on the elaborate papers on cerebro-spinal meningitis, which are contained in M. Boudin's "Traité de "Géographie et de Statistique Médicales," and Professor Hirsch's "Handbuch der historisch-geographischen Pathologie." The former was published at Paris in 1857, the latter at Erlangen in 1864.—J.S.

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changes more or less destructive, which those centres, in their own intimate composition, have at the same time undergone; and hence it is that the essential phenomena of the disease during life consists in disturbances, more or less grave, of the functions of these all-important organs. The detail of the symptoms is not the same in all cases:—for sometimes it will be in one part of the nervous system, sometimes in another, that the onslaught of the disease begins or is most severe; and, according to minor differences of this kind, the outward signs of the disease may be more expressed in this or that section or function of the Patient —in trunk or head or limbs, in sense, in motion, in mind. But these differences are inessential. A first stage, during which the irritated organs of sense and consciousness become mere sources of racking pain and miserable restlessness and hallucination and delirium, while the muscles of the body are worked into partial cramps and tremors, and presently are tortured into all the terrible struggles of tetanus or epilepsy,—and a second stage, during which (correspondently with the more advanced disease of nerve-structure) the exhausted body lies comatose and paralysed;—two stages, thus respectively characterised, are, it seems, the sum and substance of the symptoms, when the disease stops short of being *foudroyante*. The sufferer who reaches that second stage hangs by a mere thread to life; perhaps at once to sink the little remaining distance to death; perhaps slowly and painfully to recover, though it may be only with nervous mutilation.

The symptoms with which the disease most usually declares itself are shivering, intense vertigo, headache of intolerable severity, violent obstinate vomiting, and painful muscular stiffness (which soon develops into tetanic contraction) particularly of the neck and back. And these symptoms come on together, or in close sequence on one another. While consciousness lasts, the distress in the head is incessant, and even during delirium or stupor the patient's instinctive movements show that his head is still a chief seat of pain. Tongue, pulse, and skin-temperature, are not very obviously affected. The patient's face is oftener pale than flushed, and his eyes (perhaps with reddened conjunctivæ and contracted pupils) have often a look of wild distress. In some cases the region of the stomach has been much complained of, and it perhaps deserves notice that, in a considerable proportion of cases, patients are said to have discharged ascarides from the stomach or bowels. Terrible restlessness and general muscular agitation are soon added to the other symptoms, and often there is such a sensibility of surface that every touch or movement causes agony. And now, often with more and more neuralgia, the muscular contractions become more and more uncontrollable and convulsive, and affect, as in common tetanus, all parts of the body. Deglutition becomes difficult or impossible, and the respiratory movements are rendered irregular and imperfect. The head is dragged tightly backward upon the neck, and the features are fixed in the characteristic grin of lock-jaw. Happily, meanwhile the progress of the cerebral disease is darkening the patient's consciousness, and rendering him less and less percipient of the tortures of his physical being. Delirium to some extent will probably have existed from an early stage of the disease, and now tends more and more towards stupor. And so the patient passes into coma, and into depression which is on the confines of death. To this stage he may have come almost suddenly, but generally there will have been a day or two of the former one. Before the stage of coma resolves itself in one direction or the other, six or eight days may have elapsed from the first attack, and even in this time the patient will have become very greatly emaciated. In the typhoid state in which he lies, he is apt to be profusely sweating. Sometimes the cavity of his mouth is lined with a coating which is almost

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diphtheric. More or less anæsthesia often exists, or sometimes in extreme cases a state of general muscular paralysis, or in other cases drooping of the eyelids or squinting. The pupils may be unsymmetrical, or both of them may be dilated and motionless. And now frequently the patient has eruptions on the skin,—sometimes petechial, sometimes more or less imitating the characteristic exantheme of typhoid fever, measles, or other eruptive fever, but oftenest of all in the form of herpetic vesicles about the lips.

When the disease is not in its abruptest form, death, if it occurs, is generally from the fifth to the eighth day. In the other event, the duration of severe disease cannot be rated at less than three or four weeks, and convalescence (such as is possible) may be a matter of even many months' duration.

Sometimes recovery is delayed or prevented by secondary diseases which supervene,—articular or serous inflammations or pneumonia, or inflammation of the mucous membrane of the intestines, or some other kind of complication. Sometimes the intelligence, especially the memory, is damaged for a time or for life. The hearing, which generally suffers to some extent, is sometimes permanently gone; and here, if the sufferer be an infant, he will be dumb as well as deaf for life. Vision is peculiarly apt to suffer, and, either through the central disease or by secondary ophthalmic inflammations, may be lost to one eye or to both. Sometimes it is the sense of smell which is lost. Sometimes headache continues for months. Sometimes parts of the body do not recover their common sensibility. And sometimes the patient's muscular paralysis is only imperfectly recovered from.

Marked attacks of the disease are not always made without warning. Sometimes, for hours or even days beforehand, the patient will have had vague premonitions of an attack, or, to speak more correctly, its first symptoms will have come on him gradually. Among such premonitions, slight shivering fits have been particularly observed. But often nothing of the sort can be traced. And often from a state of apparent health, amid work or sleep, or at a meal, or in the street, the patient has quite suddenly fallen into an almost explosive beginning of the disease, has rapidly passed into a state which is compared to the asphyctic collapse of cholera, and has died within twelve, sometimes even within six hours, from the attack.

It deserves notice that, while cases of the above-described gravest kind are occurring perhaps not very numerously in a place, sometimes, within the same area, or scattered over a wider one, a large number of other persons will suffer slight indications of similar nervous derangement. Headache, vertigo, muscular discomfort in the head and limbs, and attacks of chilliness, are the chief of these minor indications, which apparently bear to the graver cases the same sort of relation as epidemic diarrhœa bears to concurrent epidemic cholera, and which tend after two or three days to the crisis of a profuse general perspiration. Probably these cases are of very different degrees of severity, and are not separable by any abrupt line from the severest manifestations of the disease. It is said that in proportion to their severity they share the common character of the disease in being but very slowly recovered from.

Though cerebro-spinal meningitis in its epidemic form has hardly been scientifically described till within the last 30 years, the conclusion does not follow that in that form it is a new fact in nature. For since its epidemics are, for the most part, not on a large scale in any one place, numbers of them may have passed unobserved during the less advanced times of medical science; and well-marked cases of the disease, viewed disconnectedly, may have been called by the name of some other ailment—"fit," "hydrocephalus,"

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"apoplexy," "nervous fever," "lock jaw," &c. In 1837, when its importance first began to be recognized in France, few previous epidemics of the disease were on record.* But from 1837 till now, sometimes more in one country, sometimes more in another, the disease has been continually spoken of as manifesting itself in numerous small well-defined epidemic outbreaks. The apparent beginning was at Bayonne in 1837, and within the next 12 years, 47 epidemics had been recorded in 36 of the then 86 Departments of France. The scanty medical literature of South Italy shows that at least during the seven years 1839–45 many epidemics of the disease were occurring there. During the same and some subsequent years, renewed outbreaks of the disease in Algeria were reported. Of Spain it is at least certain that, in 1844, there was a small epidemic at Gibraltar. In Denmark there were epidemics at least in the years 1845–48. In the United States of America two epidemics were observed in 1842, and, from then probably till now, epidemics have constantly been under observation in one part or another of that vast territory. In 1854 Sweden was first reported to be suffering, and within seven years had lost more than 4,000 of its population by the disease. In Norway the disease has been prevailing since 1859. Germany seems almost entirely to have escaped till a very recent period; but of late the disease has been prevailing at least in parts of Prussia, Saxony, and Hanover, and to a small extent has shown itself in Poland. Especially in the eastern parts of Prussia, well-marked epidemics have been recorded; and it was the prevalence of such epidemics about the Lower Vistula, particularly at Dantzig and Elbing, which gave rise to the mistaken popular belief that "plague" had spread thither from St. Petersburgh. Dr. Sanderson tells me that the Medical Officer-in-chief of the Circle of Dantzig reports that at least 1,000 persons have died there of the disease since Christmas. Our country meanwhile has been almost entirely without experience of the disease. In 1846, and again in 1850, something of it was indeed seen very partially in Ireland, and in the former year there was a doubtful trace of it in Liverpool.† It is possible too that we may have had small local outbreaks which have been unrecognized or unrecorded. But certainly the disease has not prevailed on a large scale in any part of the United Kingdom, and, practically speaking, is therefore almost unknown to the mass of our medical profession.

Though the causes of the disease are hitherto not exactly known, some broad ætiological generalizations about it have been made. In the first place, the disease, in whatever climate it has prevailed, has shown a very marked preference for the colder seasons of the year. Of 182 epidemics, examined in this point of view by M. Boudin, 10 were in August and September, 24 in October and November, 46 in December and January, 48 in February and March, 30 in April and May, and again 24 in June and July. In the second place, epidemics have seemed particularly apt to occur in establishments where masses of special population have been living in common domicile—as in workhouses, convict prisons, schools, and (above all) barracks. And in several

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* At Geneva in 1805, it killed 33 persons. In 1806–7 it was seen in the Prussian army. In 1807 it was at Briancon, in 1811 at Dantzig, in 1813 at Brest. In 1813–16 it visited Metz, Pont à Mousson, Sarreguemines and Mainz, as also Grenoble and Paris. In 1822 it was at Vesoul, and in 1823 at Le Mans.—Boudin, op. cit.—J.S.

† In the "Dublin Quarterly Journal" of 1846, Dr. Robert Mayne published a short Paper on the Irish experience of that year; and in the "Medical Gazette" of 1847, Dr. Whittle noticed the facts which he had observed at Liverpool. The Irish experience of 1850 was written of by Dr. McDowell in the "London Journal of Medicine" of 1851.—J.S.

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of such cases the epidemic has seemed to confine itself to one section of the establishment—to one block of building, to one floor, or to one room. It is asserted that here, as a general rule, the affected segment of population has been in overcrowded and ill-ventilated quarters. And when the disease has spread from such centres, or has independently arisen among common populations, this, almost always, is said to have been under similar unwholesomeness of circumstances. Where the epidemic has been among soldiers, officers have enjoyed almost entire immunity; and where common populations have been suffering, the disease has shown great, if not exclusive, preference for the worst-lodged classes of the community.* Reviewing the evidence which exists upon these points, I am strongly of opinion that the best sanitary precaution which in the present state of knowledge can be taken against the disease, must consist in care for the ventilation of dwellings. But, in stating this, I must add that in some cases, according to local reports, the distribution of an epidemic has very decidedly not been governed by conditions of overcrowding and ill-ventilation. And in this connection it is important to recall the fact, that during epidemics of meningitis, and while perhaps the severe cases of the disease are all in their usual close proximity to one another, often there will be (as though from some diffused morbific influence) an extensive distribution of milder cases or threatenings of the disease beyond the area in which the severer phenomena are witnessed.

Of personal predispositions to the disease scarcely anything is known. Both sexes have suffered, though apparently the male far beyond the female. And all ages have suffered, though least of all those which are most advanced. Where an epidemic has occurred among military and convict populations, its victims have of course mostly been in the prime of life; but where among the common civil population, it has often, if not generally, shown itself least sparing of youth and childhood. In the French army, it has been thought particularly to affect recruits. The fact may prove to be unimportant, that in descriptions of the disease, record has very often been made of the patient's vomitting or otherwise discharging ascarides from his intestinal canal;—but obviously the speculation which that fact suggests extends beyond the question whether the ascarides had any direct relation to the disease, and involves the much larger inquiry whether undiscovered other influences, operating on or through the intestinal surface, may perhaps have been associated with the parasites.

The very important questions remain, whether the disease is communicable from person to person, and, if so, what are the laws of its communicability. From the large experience which has now been collected on the subject, it may, I think, confidently be inferred that the disease, if directly communicable from person to person, is communicable only in a very low degree. Such communicability as is familiar to us with typhus, small-pox, and other eruptive fevers, cerebro-spinal meningitis does most assuredly not possess. To this extent, the tendency of the disease to prevail only in small compact epidemics is in my opinion a conclusive argument. But that the disease is incommunicable cannot, I fear, at present be maintained:—for the French military experience alleges that outbreaks of it in garrisons have sometimes so definitely

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* Here, however, it is worth noting that such a preference as is described for the poorer classes of the civil population need not be solely contingent on the general crowdedness and non-ventilation of their dwellings; for commonly the worst lodged parts of the population have many other sanitary disadvantages, including the very important one of improper and insufficient nourishment.—J.S.

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followed the arrival of infected soldiers from other garrisons that the arrival could not well be acquitted of contagiousness; and unless those observations have been fallacious, it must be deemed a problem of great importance to determine under exactly what conditions and circumstances the sick have thus been enabled to propagate their infection to the healthy. The principles on which such investigations ought to be conducted are now fairly understood by men of science, and it is to be hoped that the problem which I state may soon be solved. Meanwhile, in my opinion the importability of the infection of the disease cannot at the utmost be deemed more than a danger of very subordinate rank. And I think it extremely probable that, if the disease is directly communicable from person to person, or is in any manner diffusable by personal intercourse, its powers of thus spreading itself are only of so low a degree that, with ventilation and cleanliness and good sanitary appliances, they may, for practical purposes, be virtually set at naught.

It is fortunate that cerebro-spinal meningitis does not prevail in very large epidemics. For, to the persons whom it attacks, it is one of the most dangerous of diseases. In thirteen epidemics concerning which M. Boudin gives statistics, there were collectively 809 deaths among 1,304 patients; in some of the worst epidemics the mortality seems to have been as high as 80 per 100; and the disease, as now prevailing in Germany, seems to be showing at least its average, very terrible, fatality. Evidently, then, at present it can be no satisfactory task to speak of the treatment of the disease. So far as results have yet been codified, medicine seems universally to have been powerless against the disease, and perhaps in some cases to have lessened the patient's chances of recovery. The officers who have just reported to the Prussian Government on the epidemics prevailing about Dantzig advert (like many preceding writers) to the "sudden collapse which often baffles all remedies." And evidently a disease which tends to that issue will not admit that generally depressing treatment be used against it, except (if at all) with the very utmost circumspection. It is on record that one French practitioner who tried bleeding for the disease, lost 30 of his first 31 cases, while a second, using similar treatment, lost 21 out of 22; and though other practitioners have alleged that in their hands this treatment has been of good effect, certainly it could not be admissible, except under very close and careful qualifications with regard to the circumstances of its employment. Mercury has been freely tried, and seems to have been at least useless. Opium has been strongly recommended by some French practitioners, and perhaps under some circumstances has been of advantage. In various processes of disease which resemble meningitis in their nature, the local application of cold, judiciously and skilfully made, has given to modern medicine some very notable successes; and to it, more than to any known resource of the art, I should myself have been disposed to look hopefully in the present instance. Ten years ago, indeed, it was the report of an eminent German writer* that, in epidemic meningitis, that most effective of antiphlogistics could not commonly be borne by the patient. But, more recently, improved means have been found for the medical utilization of cold.† And Dr. Thudichum (who has seen something of meningitis on the Continent, and has favoured me with a memorandum on the recent epidemics in Bromberg

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* Hasse, in Virchow's "Handbuch der Pathologie und Therapie," vol. i., part 1, p. 461.—J.S.

† Professor Esmarch's paper on the Use of Cold in Surgery (translated in 1861 for the New Sydenham Society) marks, in my opinion, an epoch in the matter to which I refer. His method of refrigeration is to use india-rubber bags made of any required shape, and filled with ice, snow, or some freezing mixture.—J.S.

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and Ottmachau) tells me that present experience in Germany is in favour of this principle of treatment.

Concerning whatever progress is to be made in the treatment of the disease, as well as concerning whatever is to be learnt of its causes, I shall continue to look anxiously to the countries where epidemics are now prevailing. As there is no country in the world where the medical sciences are better cultivated than in Germany, so it may reasonably be hoped that, during the visitation which that country is now suffering, important light may be thrown on the causes, prevention, and treatment of a disease which hitherto is most imperfectly understood. It may also be hoped that the course which the Lords of the Council have taken, in directing observations to be made of the present foreign epidemics, will ensure for this country an immediate participation in whatever useful knowledge our German contemporaries may acquire.

April 19, 1865. (Signed) JOHN SIMON.

From the Ninth Report to the Privy Council, 1866.

[The Ninth Report comprises a section relating to Public Vaccination which has appeared in Vol. I., pp. 366–70. In this report observations are continued on the Distribution of Disease in England, under which uniform heading a description is given of Dr. Buchanan's most important investigations and discoveries respecting the Relation of Phthisis to Soil Moisture. The report contains sections relating to Proceedings against Cholera under the Diseases Prevention Act; the Sanitary Act of 1866; and the Cholera Conference at Weimar. Together with this report of Mr. Simon's are reprinted parts of the Appendix which were written by himself.—ED.]

DISTRIBUTION OF DISEASE IN ENGLAND, AND THE CIRCUMSTANCES BY WHICH IT IS REGULATED—*cont.*

Works of sanitary improvement in England.

The inquiry of this department into the results hitherto obtained by local authorities in their endeavours to improve the public health within their jurisdiction has been among the most important and most interesting which I have had, under the Lords of the Council, to superintend. For my Lords, in their sanitary jurisdiction, can fulfil no higher usefulness than that of making new local experiences conducive to general enlightenment. And here was emphatically a case where that function required to be fulfilled. Certain of our English proceedings, specially our modern works of town-drainage with water-supply, have been great popular experiments in the

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management of the public health: experiments, it is true, which medical science could not deem of doubtful promise: but not the less—to the popular mind—experiments which must be judged by their actual fruits. Till the sanitary experience of our best-cared-for populations had been given fully and frankly to the world, experience ripe enough for critical and conclusive judgment, the example of such populations could not be of general influence, nor could the advocates of sanitary improvement establish that their case was complete. The public, therefore, and not only our own public, but also the public of other European states, has long been anxious to possess such information as the present inquiry has aimed at. It was essential, however, that the inquiry should not be prematurely made; and it was not till two years ago that I felt myself entitled to hope that the undertaking could be free from some such reproach. In 1865 I submitted to their Lordships that the inquiry might now, in my opinion, be made with the certainty of giving valuable, though of course not final, information; and their Lordships thereupon authorized me to institute the inquiry, with the assistance of Dr. Buchanan, as inspector. In my last annual report it was adverted to as then in progress, and it has now been conducted to a conclusion. It has related to 25 towns with an aggregate population of more than 600,000 persons; and though in some of the 25 towns structural improvements have but very recently been made, in others such improvements have been in action for seven or eight years and upwards.

Anyone who would do justice to the very remarkable mass of evidence which this inquiry has elicited must study the 25 cases separately and in detail; for only thus can the circumstances be appreciated which, sometimes by exaggerating, sometimes by counteracting or concealing, particular investigated results, give more or less of exceptionality to parts of many of the cases, and render the task proportionately difficult to speak of the 25 cases as of one.

Summary Table at pp. 273–4.

Into the annexed table however (pp. 273–4) I have abstracted those numerical results on which, when duly corrected, the broadest of our generalisations in the matter of the inquiry repose. And as an introduction to the reader's detailed study

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of Dr. Buchanan's report, I may here briefly draw attention to the successive columns of that table.

The column which I have headed with the letter A shows for each place in the list what difference there has been, since sanitary works have been constructed, in the *General Death-Rate* of the population. These "general" or "total" death-rates—*i.e.* rates which tell how many deaths per given population have occurred in the given time *from all causes* together and *at all ages* together, do not admit of such exact interpretation as rates in which the causes and the ages are distinguished; but of course the latter, more discriminative, death-rates tend entirely to lose their value in proportion as the distinctions which they represent have not been accurately drawn by the original recorder of facts. Registers of causes of death are (as I shall hereafter explain) very far from being uniformly trustworthy; and thus cases often arise where a comparison of general death-rates is the most instructive comparison which can be made; assuming always here that numbers of population are known, and that ages are in like relative quantities, and that notes of important epidemic disturbances are given. Subject to these very obvious cautions, a comparison of general death-rates is a rough and ready, but fairly trustworthy, comparison of degrees of health. In this point of view I refer to column A; observing that column B gives the general death-rates of A *minus* the inconstant influence which has been exerted by the chief infantine epidemics; and similarly that column E gives means for eliminating from A the influence of the cholera-epidemics of 1848–9, 1854, and 1866.

The columns C to G inclusive are for comparing (as far as practicable) the quantities of particular kinds of death caused in each of the places in the two compared periods. Such "special death-rates," used with great caution, yield the most useful of all possible conclusions as to changes wrought in the public health: but the utmost caution in using them is indispensable, because the detailed statements which they purport to sum up are often very unequally trustworthy. The fallacies to which they are peculiarly open arise in the present and past states of our system of death certification. The law

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has never required that causes of death should be medically certified; and the result has been that certificates of causes of death (in varying proportions at different times and in different places) have been given by unskilled persons in such quantity, and often by skilled certifiers with so little view to statistical uses, that our most authentic (registered) information as to causes of death cannot ever be accepted without some misgiving. Further, as the quantity of non-medical certification of causes of death is probably much less now than it was (say) 20 years ago, and as likewise the discrimination and naming of diseases within the ranks of the medical profession itself has within the same time much improved, so in the annexed table any half-column which gives special deaths "after the "works" may often, as compared with its fellow "before "the works," represent a higher mortality than is its due; or, in other words, deaths which ought to have come within the statistics of these special columns are more likely to have gone astray in the years "before the works" than in the years "after the works." This may particularly apply to columns C and D. And I am disposed to believe that if they (especially D) were free from that source of fallacy, the evidence of the successful towns might be much more harmonious than it is.

In reading column H, the possibility has to be borne in mind that the relative quantity of infantine population in a place may have varied from time to time, and that the number of the infantine deaths in proportion to the population may in consequence have varied, independently of any variation in the local health. In Croydon, for instance, the general healthiness has been very importantly improved; but, if column H were read without the requisite interpretation, it would seem that the death-rate of infants in Croydon had increased; the fact no doubt being that Croydon, with its rapid increase of population, is having an exceptionally high birth-rate, and that its infantine population must bear to the entire population a very much higher proportion than it bore in 1845–50.

Subject to cautions such as the above, the table will pretty well speak for itself. And of everything which seems excep-

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tional or contradictory in it, detailed criticism, and nearly always (I think) very satisfactory explanation, will be found in the ample details of Dr. Buchanan's laborious and most accurate report. It will be useless for me here to dwell on points of this sort; but I need not refuse myself the very great satisfaction of referring to some of the splendid results which are recorded there.

Cardiff.

Foremost, I must name CARDIFF. Of the monstrous mortality which that town suffered before its sanitary works were constructed, nearly a third part has now ceased. The death-rate by typhoid fever has fallen from 17½ to 10½; and that by diarrhœa from 17¼ to 4½. The death-rate by cholera in 1848–9 was 208; in 1854 it was 66; in 1866 it was 15½. The results obtained in Cardiff are the more creditable to those who have wrought them, as the difficulties to be conquered were specially great. The authorities of the place have done a great public service, and set an admirable example; not least in their choice of a medical officer, and in their confidence in him whom they have appointed. I can have few happier duties in my office than that which I now fulfil, in referring to the terms in which Dr. Paine is spoken of by Dr. Buchanan, as formerly (in my 7th report) by Dr. Hunter, and in expressing my belief that Cardiff and England are already indebted to his zeal and efficiency for the saving of many hundreds of lives.*

Newport.

In gross results NEWPORT is at present not far below Cardiff; but, on the one hand, the task of its improvement has, I believe, been far easier; and, on the other hand, so much amendment still remains to be made in Newport, that I suspect more share of statistical accident in its present figures. If infantine epidemics (which here might cause some ambiguity) be excluded, the reduction on the former mortality is about 32 per cent. in Newport against about 35 per cent. in Cardiff. Typhoid fever and diarrhœa together have fallen from about 27 to about 17. The cholera-rate was 112 in 1848-9, and in 1866 was 12. The principal improvement in the health of the place seems to have been consequent on a better water-supply which was given about 18 years ago. Newport.

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* Of the other 24 towns reported on, only four, Leicester, Newport, Merthyr, and Bristol, have given themselves the advantage of the appointment of a medical officer of health; and in Leicester alone is the appointment more than five years old. Dr. Buchanan, in these four cases, praises the exertions of the respective officers, Dr. Moore, Dr. B. Davies, Dr. Dyke, and Mr. D. Davies. In several other cases, local medical practitioners have given their fellow-townsmen valuable unpaid services, sometimes of a laborious kind, and have thus greatly promoted sanitary progress. I may specially name Drs. Westall and Carpenter, of Croydon; Mr. Rumsey, and Drs. Wright and Wilson, of Cheltenham; and Mr. Middleton, of Salisbury. Very efficient voluntary aid to sanitary progress has also been rendered in Macclesfield by Mr. May, the clerk to the board of guardians, and in Ely by Mr. Marshall, the superintendent registrar of the district.—J.S.

Croydon. Macclesfield. Salisbury. In each of the three towns of CROYDON, MACCLESFIELD, and SALISBURY, a reduction of 20 per cent. on the previous local death-rate has been obtained. The rates of typhoid fever and diarrhœa have diminished about as follows:—in Croydon, from 25 to 12½; in Macclesfield, from 25½ to 19½; in Salisbury, from 14 to 4. The cholera rate in Salisbury was 180 in 1849; in 1854 it was 14⅔; in 1866 perhaps 1.

Merthyr Tydfil. Of few places in the list is the progress, all things considered, more pleasing and hopeful than that of MERTHYR. This place used to be abominable. It had almost the unwholesomeness, with but a fraction of the apology, of Liverpool. In our statistics for 1851-61 it showed every possible evidence of sanitary neglect; in fever, in diarrhœa, in cholera, in small-pox, in phthisis and other lung-diseases, in mortality of children, test it how one would, it always was conspicuously bad; and when medical inspections were made there, every report told the same lamentable story of sanitary nonfeasance to the utmost. But now improvement has fairly begun. Till 1861 its steps were at the best leisurely, but since 1861 they have been accelerated. Above all, since that date, water, which used to be cruelly scant and disgustingly foul, has been replaced by a good and ample supply. And now a system of sewers has just been completed. The results hitherto obtained—results, namely, from improved removal of nuisances, from abatement of over-crowding, and above all from the purer water supply, are, that the present mortality is a fifth less than the old; the death-rate from typhoid fever and diarrhœa has fallen from 33 to 15; and the death-rate from cholera, which in 1848 was 267, and in 1854 was 84, was in

Merthyr Tydfil. 1866 only 20. As an officer of health has now (since 1864) been appointed, and as further structural works are now coming into operation, I confidently expect and hope that a few years hence a further great reduction will have been made in the still excessive mortality of Merthyr.

Brynmawr. BRYNMAWR, on a small scale, is a most creditable case of sanitary improvement. Paving, thorough sewerage, good water-supply, constant attention to nuisances and removal of filth, have been the means employed; and they have succeeded against some difficulties. Brynmawr saves 15 per cent. on its former general mortality. Its death-rate by typhoid fever and diarrhœa has fallen to about half what it was. Cholera, which in 1849 killed 1 per cent. of the population, has since then done no execution.

Banbury. Ely. BANBURY has saved 12½ per cent. on its former mortality, and ELY, according to two different estimates of its population, 10 or 14. In Ely typhoid fever, and in Banbury both typhoid fever and diarrhœa, are but half as fatal as they used to be.

Of places where the savings have hitherto been less considerable (and in many this depends on the fact that the previous mortality was less excessive) four of the most important may

Dover. be particularly noticed. DOVER has only saved 7 per cent., but this has been on a death-rate previously moderate for an unreformed town; and the improvement includes a reduction of the rate of typhoid fever and diarrhœa from 23½ to 16. Its cholera-rate, which in 1849 had been 40, and in 1854 10,

Leicester. was in 1866 only 4½. LEICESTER had and still has a high death-rate; but a diminution, though only a small one, has been made during the few years that the works have been in action, and the fatality of typhoid fever is little more than

Bristol. half what it was. In BRISTOL (including Clifton) the full completion of works has been so recent that the time had certainly not come for a conclusive inquiry as to their results; and also from local reasons the statistics cannot be so expository as in most other cases; but even now there are proofs that the health of the town has been advantageously influenced by such of the works as were first in operation; and it must be remembered that in so large a town as Bristol, important

Bristol.

absolute savings of life result from even small percental reductions of mortality. Excluding infantine epidemics, the general mortality is reduced about 4½ per cent. Typhoid fever and diarrhœa have lost about a fifth of their fatality The cholera death-rate was 82 in 1849, 11 in 1854, 1½ in 1866.

Cheltenham.

The general death-rate of CHELTENHAM is reduced not quite a twentieth part; but then its original rate was less than most of the reformed rates in our table; and its death-rate by typhoid fever, now 4¾, was originally only 8.

Warwick.
Penrith.
Stratford.
Alnwick.
Morpeth.
Ashby.

In other places than those I have named, the reduction of typhoid fever has been generally not less than in the above cases. The death-rate, namely, has fallen in WARWICK, from 19 to 9; in PENRITH, from 10 to 4½; in STRATFORD, from 12½ to 4; in ALNWICK from 13½ to 8⅔; in MORPETH, from 16½ to 10; in ASHBY, from 13⅓ to 5¾. Anyone who studies the figures of column C, and not least (with Dr. Buchanan's comments) the few exceptional facts which are represented there will find in them a practical lesson which it is absolutely impossible to misunderstand. And scarcely less instructive is column D, though unfortunately with a larger number of exceptions; some of which, however, I suspect to be deceptive through fallacies already referred to. Column E is also one which at the present moment may be read with more than ordinary interest; showing how the power of epidemic cholera has declined, in face of the structural improvements which have been in progress.

These results, and some others which the table shows, might, I think, be most confidently anticipated; for cholera and typhoid fever, and other endemic bowel affections, are well known to stand in intimate ætiological relation to the pollution of air and soil and water with decaying excremental matters; and our statistics, unless they had been fallacious, could hardly have failed to show a diminished liability to these diseases in places where air and soil and water have been dis-polluted by sanitary administration.

But in contrast with columns which only confirm previous knowledge, columns F and G, to which I have not yet adverted, record facts for which I was not in any degree prepared. These columns, namely, appear to indicate a

Diminution of Phthisis in certain of the towns.

partial dependence of PULMONARY PHTHISIS on some of the unwholesome conditions which have been removed. And when detailed examination is made of the cases which give that indication, and they are compared with the different class where phthisis has not lessened its amount, the novel and most important conclusion suggests itself, that *the drying of soil, which has in most cases accompanied the laying of main sewers in the improved towns, has led to the diminution, more or less considerable, of phthisis.* The facts which are yet in evidence seem most strongly to support this conclusion, which, should it be substantiated, will constitute a very valuable discovery evolved by Dr. Buchanan from the inquiries here reported on. In the adjoining table, or in the table [A] which Dr. Buchanan particularly gives to this matter, it will be seen that the reduction of phthisis, where certain works have been executed, is far too large and far too general to be regarded as an accidental coincidence. The reduction, namely, on the death-rates by phthisis in the first fifteen towns in Dr. Buchanan's table, are as follows :—Salisbury, 49 per cent. of its previous rate ; Ely, 47 per cent. ; Rugby, 43 ; Banbury, 41 ; Worthing, 36 ; Macclesfield, 31 ; Leicester, 32 ; Newport, 32 ; Cheltenham, 26 ; Bristol, 22 ; Dover, 20 ; Warwick, 19 ; Croydon, 17 ; Cardiff, 17 ; Merthyr, 11. And the fact that in some of these cases the diminished fatality of phthisis is by far the largest amendment, if not the only one which has taken place in the local health, becomes extremely interesting and significant, when the circumstance is remembered that works of sewerage, by which the drying of soil is effected, must always of necessity precede, and do indeed sometimes precede by years, the accomplishment of other objects (house-drainage, abolition of cesspools, and so forth) on which the cessation of various other diseases is dependent. Thus, as regards the two largest populations concerned in this question, those of Bristol and Leicester ;—no doubt the comparative smallness of effect hitherto produced on the general and diarrhœal death-rates of these towns may (so far as it is not fallacious) be referred to the shortness of time for which finished constructions have been at work for the detailed dis-pollution of houses and their dependencies ; but a reduction already of a sixth in the phthisis

Diminution of Phthisis in certain of the towns.

mortality of Bristol, and a reduction of a fourth in the phthisis mortality of Leicester, are apparently connected with the fact that, in both towns, main sewerage on a large scale, with more or less drying of soil, has existed, in comparison, for many years. And Rugby which, long as it has been at work, has not yet succeeded in getting rid of endemic diarrhœa and typhoid fever, shows at least this result of its main drainage works, that its phthisis mortality has fallen 43 per cent.

Results of the inquiry useful though not final.

Reviewing the inquiry as a whole with reference to the objects for which it was undertaken, I think I may venture to say that it has been very fairly successful. True, that the results which have been elicited are not in all cases equally intelligible, nor, of course, in all cases equally satisfactory. But, on the whole, the results are such as can be well understood by all who will somewhat carefully consider them, and such as deserve to be well pondered by the local authorities of the country. If hereafter other inquiries of the same sort are made, the investigator will doubtless have an easier task than we have now had; for the quality of the rough material of medical statistics is always in course of improvement. And also he will probably have a far simpler exposition to make; for, when the evidence of longer periods can be collected, apparent exceptions become fewer, and the meaning of evidence far less doubtful. Meanwhile, however, the present records may fulfil very important provisional uses; not only to confute persons who have despaired, or affected to despair, of any great preventability of disease; but still more to justify in the public eye, and to encourage in some of the noblest of human labours, those who for long weary years have been spending their powers in this endeavour, and to whom surely it will be the best of rewards to see demonstration of the good they have wrought.

In conclusion I may be permitted to mention, though not strictly within the business of my present report, that the indications elicited by Dr. Buchanan as to the existence of some ætiological connexion between phthisis and local dampness of soil, have seemed to me so important that I have submitted to my Lords the expediency, in my opinion, of further inquiries in that special direction; and, as their Lordships have been pleased to direct such further inquiries to be made, I hope to be able in some future report to bring other facts into evidence on the subject.

PROCEEDINGS AGAINST CHOLERA UNDER THE DISEASES PREVENTION ACT AND OTHERWISE.

Proceedings against cholera.

The proceedings which the Lords of the Council took in 1866 under the extraordinary powers of the Diseases Prevention Act (including, of course, the proceedings which were preliminary to putting this Act in force) were rendered necessary by the renewed presence of Asiatic cholera in England.

A year ago, when making my report for the year 1865, I had to state that, during the period then reported on, cholera had once more become widely prevalent in Europe, and had already, though but in very small extent, shown itself in this country. As matter of anticipation it was then scarcely less than certain that the year 1866 would not come to an end without cholera having been seen here in much larger amount, And that antecedent probability has now been justified by the result. We suffered during 1866 very considerably from the disease; and even yet it would be premature to say that our share of suffering from the present fourth extension of Asiatic cholera is at an end.

Rise and progress of cholera in England in 1866.

The history of the disease in England in 1866, and of the proceedings taken by my Lords in relation to it, is, briefly, and so far as the facts came before this department, as follows.

On the 28th of April a first case was reported from Bristol, that of a trader who had arrived there sick from Rotterdam.

On May 15th telegrams from Liverpool and Birkenhead reported that the disease was prevailing on board certain vessels in the Mersey among German and Dutch emigrants, who, with a view to crossing the Atlantic for New York, had come in flocks, travelling rapidly from the continent, often from infected parts of it, by way of Hull, Grimsby, and other of our north-eastern ports, and had now fallen ill at their port of embarkation. Much alarm was occasioned by this outbreak; the more, as new arrivals of the same sort were occurring from day to day; and my Lords, under the circumstances,

TABLE REFERRED TO (pp. 263–272 & 297) AS ILLUSTRATING THE IMPROVEMENTS OF PUBLIC HEALTH WHICH RESULT FROM PROPER WORKS OF DRAINAGE AND WATER-SUPPLY.

Population in 1861.	TOWNS in order of their Population.	Periods for which the Death rates are compared.		DEATH-RATES PER ANNUM, total and particular, per 10,000 of general Population, for each of the compared periods.																
				A General Death-rates.		B General Death-rates, after excluding small-pox and other infantine epidemics.		C Typhoid Fever.		D Diarrhœa, excluding Cholera so called.		E Cholera in each of the three Epidemics.			F Phthisis.		G Phthisis and other Pulmonary Diseases of Women aged 15–55.		H Death-rates of Infants under one year of age.	
		Before the Works.	After the Works.	Before the Works.	After the Works.	Before the Works.	After the Works.	Before the Works.	After the Works.	Before the Works.	After the Works.	1848–9.	1854.	1866.	Before the Works.	After the Works.	Before the Works.	After the Works.	Before the Works.	After the Works.
160,714	BRISTOL - -	1847–5	1862–51	245½	242	215	205¾	10	6½	10½	9½	82	11	1½	31	25½	16	13⅓	54	52
68,056	LEICESTER - -	1845–51	1862–4	264	252	236½	225⅓	14⅗	7¾	16	19⅓	1	10	–	43⅓	29¼	17¾	16	84¼	81
52,778	MERTHYR - -	1845–55	1862–5	332	262	292⅓	221¼	21⅓	8⅔	11½	6¼	267	84	20	38⅔	34⅓	15½	13¾	80¼	61
39,693	CHELTENHAM -	1845–57	1860–5	194	185	182	172	8	4¾	8⅓	7	–	–	–	28¾	21¼	15	11¾	40½	37
32,954	CARDIFF - -	1847–54	1859–66	332	226	294	191½	17½	10½	17¼	4½	208	66	15½	34¾	28⅔	all ages and both sexes 66	58⅔	?	?
30,229	CROYDON - -	1845–50	1857–64	237	190	207	178¼	15	5½	10	7	27	21	2	?	?	all ages and both sexes 59½	49	?	?
29,417	CARLISLE - -	1845–53	1858–64	284	261	244	225	10	9¾	11⅓	12½	22	6	–	32	35⅖	16½	16⅔	71	65½
27,475	MACCLESFIELD -	1845–52	1857–64	298	237	263⅓	217½	14¼	8½	11⅓	11	9	1	–	51½	35⅗	28⅓	22	77½	59⅔
24,756	NEWPORT - -	1845–49	1860–65	318	216½	275	187½	16⅓	10⅓	11	6½	112	1½	12	37	25	14	12½	67¼	53¼
23,108	DOVER - -	1843–53	1857–65	225½	209	203	187	14	9	9½	7	40	10	4⅔	26½	21¼	13⅓	11¼	47¾	46⅓
10,570	WARWICK - -	1845–55	1859–64	227	210	209¾	191⅓	19	9	5¾	8	10½	–	–	40	32⅓	16⅔	14⅔	51¼	46¾
10,238	BANBURY - -	1845–53	1857–64	234	205	214	184½	16	8½	11⅓	5½	2	1½	–	26⅔	15⅔	14⅔	9⅓	53	45
9,414	PENZANCE - -	1843–50	1856–65	221	222	197½	200⅓	7½	8	5⅓	9⅓	–	–	–	30⅔	29	13¼	14	?	?
9,030	SALISBURY - -	1844–52	1857–64	275	219	253⅔	198½	7½	1¾	6⅓	2⅓	180	14½	–	44⅓	22⅔	all over 20 both sexes 53½	38½	43	40
8,664	CHELMSFORD -	1843–52	1855–65	196⅓	215	180	187⅓	12	12⅔	7	8	4	–	–	32⅓	32⅔	12⅔	14⅓	44	42¾
7,847	ELY - - -	1845–52	1859–64	228	205½	210	186¼	10⅖	4⅓	3¾	4¼	–	22	–	31	16¾	all ages; both sexes 48	36	50⅓	42⅓
7,818	RUGBY - -	1845–51	1855–64	191	186	164	164½	10	9	2⅕	7½	–	–	–	28½	16¼	15	7	42½	45
7,189	PENRITH - -	1845–52	1856–64	253½	250	235½	230½	10	4½	3⅚	4⅚	9½	2½	–	39⅓	37½	17	19½	55⅘	55½
6,823	STRATFORD - -	1845–53	1860–64	217	202	212¼	178	12½	4	11¼	5¾	–	–	–	26⅔	26½	14	13	46	48
6,494	ALNWICK - -	1845–51	1856–64	262	247	240	221½	13½	8⅔	7	4⅔	205	–	–	28⅓	33	13½	17⅓	?	?
6,334	BRYNMAWR - -	1843–52	1856–65	273½	232⅓	232	209	23½	10¼	5	4¾	100	–	–	28⅓	30	14¾	13¾	76½	69
5,805	WORTHING - -	1843–52	1857–65	155	153	139	136½	7½	9¼	4¾	5½	–	–	–	30½	19½	14¾	9¼	24¼	22⅓
4,490	MORPETH - -	1845–52	1856–64	262	247	234	225	16½	10	8½	14½	14	11½	–	30½	28	14	14⅔	56	57½
3,840	ASHBY - -	1845–51	1855–64	216	202½	213	184	13⅓	5¾	4	8⅓				25½	31⅓	16	13	48	31

Rise and progress of cholera in England in 1866.

thought it expedient to put the Diseases Prevention Act in force for the endangered places. An inspector (Dr. Buchanan) was also sent down to advise and assist as might be necessary; and the authorities acted with vigour and judgment. The outbreak, so far as England was concerned, soon came to an end; but the subsequent progress of the emigrants was unfortunately not unattended by cholera. Indeed, in several cases, vessels such as the above, leaving in apparent health, suffered during their voyage cholera-deaths among their passengers and crew, and were of course very dangerous arrivals for their port of destination.

Within the next few days after the 15th my Lords were apprised of the first two cases of what afterwards became a serious epidemic at Swansea; and single cases in various other parts of the country were also notified to them. Anxiety became general in the country; and there was much correspondence with local authorities, often on precautions to be taken against the disease, or provisions to be made for treating it, and often on questions of jurisdiction and responsibility.

On June 15th my Lords were informed that the Peninsular and Oriental Company's steamship "Poonah" had arrived at Southampton with a case of cholera on board, and that several other cases had appeared in the town. On the 29th two deaths were reported by telegram to have happened at Goole, whither clearly the disease had been imported from Antwerp. On the 30th three deaths were reported to have occurred at Northwich in Cheshire, and on the same day a case of cholera occurred at Shields on board the "Clio," from Hamburg. On July 3rd a case was reported to have happened at Harwich, on board the "Redstart," from Brussels; and on the same day, from Brixham, the death of the captain of a coasting vessel was reported.

Evidently England was now being infected in many different directions, and could hardly hope to escape a serious extension of the disease. Reports of new centres of infection became more and more frequent; and on July 14th my Lords felt that the time had come for putting the Diseases Prevention Act in force throughout the whole of England and Wales. They accordingly now issued their Order for that purpose.

Rise and progress of cholera in England in 1866.

And henceforth ample powers of medical relief (not restricted to paupers) were exercisable by local authorities throughout the country.

On July 18th, from Poplar, the first cholera death in the metropolis was reported. Two days afterwards my Lords learnt that already there was an alarming proportion of cholera cases in parts of East London; and on the 21st the secretary of the London Hospital reported that the resources of that most useful institution were being overtasked by such claims for admission as attested a very terrible epidemic of cholera. For details as to this epidemic, and its probable cause, I may refer to a final report on it made by Mr. Radcliffe, which I subjoin [A].

Hitherto the proceedings of local authorities under the Diseases Prevention Act had been discretionary; but now, with the increased dimensions of the danger, my Lords thought it their own duty to define and require, by such regulations as the Act empowers them to make, the specific services which local authorities ought to be rendering to the public. Accordingly, on the 20th and 21st of July, their Lordships issued such regulations: viz., a first set, applicable to the three unions of the City of London and to all extra-metropolitan unions and parishes, and a second set, applicable to all places within the scope of the Metropolis Local Government Act; the distinction being that in the first-named class of places the regulations had to be locally administered by the authorities of Poor Law relief, whereas, in the second-named class, the local authorities are the Vestries and District Boards of the not-city parts of London.* Copies of the two sets of

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* Section xi. of the statute, 23 & 24 Vict. c. 77., enables the Lords of the Council to vary, in certain cases, the ordinary effect of the Diseases Prevention Act as to the authorities by which the Act is to be executed. The general intention of Parliament has been (and for very obvious reasons) to vest the local administration of the Diseases Prevention Act in the hands of the ordinary administrators of Poor Law relief. But Parliament, in 1860, when reconsidering this subject, acceded to the wish of the vestries and district boards of London, that the not-city parts of the metropolis should be dealt with on a different plan, and that here the nuisance authorities, since they are advised by medical officers of health, should be the local authorities for administering the Diseases Prevention Act. It was obvious that the argument on which this exception was conceded might apply to some other places; but Parliament did not see fit to name any other exceptions to its rule. It, however, vested in the Privy Council the limited discretion to which I here refer, viz., that in places where special

Rise and progress of cholera in England in 1866.

regulations, together with an amendment which they received in their shipping clauses some weeks later (when the passing of the Sanitary Act, 1866, had first rendered such an amendment possible) are subjoined. With the issue of these regulations, a memorandum which I had prepared as to their application, and generally as to precautions which ought to be taken against cholera, was published and extensively circulated; and, with this, a detailed memorandum on measures of disinfection, as well as our general memorandum on precautions against epidemic disease. Copies of these momoranda are subjoined [A].

The epidemic affection of England was now rapidly tending to its maximum of diffusion, and for some weeks the applications of all sorts made to the department were very numerous. The greatest number of cases of cholera in England on any one day in the year may possibly not have been reached till about the first week of September; but the greatest quantity of alarm on the subject had certainly been some weeks earlier. After the end of September the disease rapidly died away throughout the country; making, however, here and there, occasional small fresh outbreaks even down to the end of the year.

I am not able to say what during 1866 was the total fatality of cholera in England; but from the Registrar-General's report of the returns made to him, I learn that in the three months, July, August and September, 10,365 cholera deaths were registered, in addition to 9,570 deaths by diarrhœa. And a table which I subjoin [A]—a sample of the weekly accounts which were compiled in this department from the returns of local officers during the epidemic, will serve to show, at

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nuisance authorities exist in distinction from Poor Law authorities, the Lords may, if they see fit, authorize such nuisance authorities to be, instead of the Poor Law authorities, the administrators of the Diseases Prevention Act. The single place in regard of which my Lords saw fit to exercise this power was Southampton; their Lordships being here strongly moved by two authorities whom the question concerned, and finding that the local circumstances were so peculiar as to justify the exceptional treatment. The general view taken by their Lordships, after careful consultation with the Poor Law Board, was that cases must be extremely rare in which the transfer would not be disadvantageous.—J.S.

least approximately, what parts of England were suffering from cholera at the time when probably this infection was the most widely diffused in the country.

Proceedings of the Privy Council as to cholera.

The proceedings which my Lords took in 1866 with reference to the general danger of cholera in England have already been stated. With reference to the particular local epidemics, my Lords proceeded almost invariably by correspondence alone. Their power of engaging medical inspectors, closely limited by circumstances as it is, would have been utterly insufficient for the crisis, if they had pretended, otherwise than in very exceptional cases, to communicate by this personal agency with local authorities. And even apart from this consideration, it was to be remembered that any too liberal employment of departmental inspectors on local service might be construed as exonerating local authorities from responsibilities which are properly theirs. The few occasions on which inspectors were employed with direct reference to outbreaks of cholera were principally in or near the metropolis. The East London epidemic was of such magnitude and concentration as peculiarly to require the vigilance of the department, and to justify any assistance which it could give to local authorities; so at various times Dr. Seaton, Dr. Buchanan and Dr. Hunter, were sent into the eastern districts, to observe the progress of the disease and the sanitary circumstances of the sufferers, or to confer with local authorities on measures of prevention and treatment; and also, at the request of the Lords of the Council, Mr. Secretary Walpole gave the department the advantage of the advice of Mr. Rawlinson and Mr. Arnold Taylor, of the Local Government Act Office, as to the state of the works of the East London Water Company. Dr. Buchanan further visited the unions of Greenwich, Deptford and Woolwich, the town of Holyhead, including the Irish Mail Steamers establishment in that place, the village of Pill, near Bristol, and, for a second time, Liverpool: in addition to which, Neston was visited by Dr. Hunter, Carnarvon by Dr. Seaton, and Southampton, as in 1865, by Professor Parkes. In my Appendix are contained all the more important reports which reached me in relation to the above cases, including Mr. Radcliffe's report on the very elaborate research which he has made into the facts and circumstances of the great East London epidemic.

Scientific investigations of cholera.

One sort of proceeding which my Lords took in relation to cholera during the year remains yet to be mentioned. I had submitted to their Lordships that many pathological and medical questions, as to the nature and habits of the disease, and the principles on which it ought to be treated, were still matters of scientific uncertainty; and that, in my opinion, it was very greatly to be desired, in the interests of mankind, that, during the presence of the disease among us, methodical attempts should be made, by the researches and observations of skilled persons, to narrow, if possible, the limits of those large uncertainties. My Lords were pleased to accept this view, and afterwards to sanction a scheme, which at their desire I had submitted to them, for the organization of some such work under their auspices.

The proposed branches of inquiry were as follows:—1) examination of the degrees of success attained by different methods of *treatment* of cholera, especially as practised in the London hospitals; 2) study of the successive *chemical changes* undergone by the body in cholera, and of the relations subsisting between those changes and the symptoms which the patient presents during life; 3) similar study, chiefly microscopical, of the successive *anatomical changes* of the affected body; 4) verification of alleged experimental proofs of the *communicability of cholera;* 5) collection of facts, in the line of study opened by Professor v. Pettenkofer, of Munich, as to the non-coincidence of local epidemics of cholera with such conditions of the local ground-water as are indicated by a full state of surface-wells. For the first of these objects, four physicians of leading metropolitan hospitals—Dr. Wilks of Guy's, Dr. Martin of St. Bartholomew's, Dr. Hughlings Jackson of the London, and Dr. Bristowe of St. Thomas's, consented to act together as a committee of investigation for the Privy Council; and it was intended that, if the epidemic extended westward in the metropolis, other representative physicians should be added to their number. The second

Scientific investigations of cholera.

object was referred to Dr. Thudichum, as a development of the work on which he was already engaged for the department. The third, from unavoidable circumstances, remained in abeyance. The fourth was undertaken by Dr. Sanderson. And the fifth (likely in part to join on to meteorological studies) was put into the hands of Mr. Glaisher, of the Royal Observatory, Greenwich.

The results of these several studies are in part given in my Appendix, but in other part are still incomplete. Happily for our endangered population, opportunities for scientific investigation of the disease neither became so general in London, nor continued for so long a time, as to enable any great programme to be fulfilled.

Towards the end of the year, Dr. Wilks, on the part of the Treatment Committee, informed me that the information before the committee was not enough to form the basis of a satisfactory report; and under these circumstances I conveyed to him their Lordships' request that the committee—since the epidemic as yet might perhaps be only suspended—would continue in function till the end of the present year. At the same time, as it seemed important to have some testimony to the quality of this epidemic (so far as yet seen) in relation to medical practice, I had their Lordships' authority to request from Dr. Sutton, who had been in charge of Miss Sellon's temporary East London Cholera Hospital, a report on the medical experiences of that most serviceable charity; and I now subjoin [A] the report which Dr. Sutton has in consequence written. In this context, too, I may permit myself the pleasure of referring to various interesting papers in relation to the East London epidemic which are contained as an appendix in the recent (third) volume of "Clinical Lectures "and Reports by the Medical and Surgical Staff of the London "Hospital," and which probably represent, as well as if they had been contributed from a wider area, the latest relations of cholera to medical treatment. Among them, in this point of view, I would particularly refer to the account which Mr. Little gives of a few cases where he tried with much thoroughness the practice of injecting, and, in case of need, re-injecting, saline fluid into the blood of persons in collapse.

Scientific investigations of cholera.

The chemical investigation of cholera was pursued most laboriously by Dr. Thudichum at St. Thomas's Hospital; and I subjoin [A] the report which he has made of the very interesting results hitherto obtained by him in that study.

That our last year's arrangements for investigation could not include the anatomy, and especially the microscopy, of the body in cholera, was matter for much regret;* the more so, as that line of study in Germany has led some of our fellow-labourers there to new and striking observations, which, under more favourable circumstances, if they had not been simultaneously made here, might at least have been verified and perhaps extended. For it is again alleged, and now as the discovery (or rather re-discovery†) of two independent German observers, Ph. Dr. Thomé of Cologne, and Professor Klob of Vienna, that the stomach and intestines of cholera patients contain within them microscopical fungic bodies, innumerable and vehemently multiplying, whereof swarms are shed, with prolific and infective power, in each characteristic evacuation of the sick.‡

The fourth branch of the inquiry was conducted by Dr. Sanderson to a satisfactory conclusion; and I subjoin [A] his report on the subject.

The fifth, under the most favourable circumstances, could not have been illustrated more than in small part during the year; but Mr. Glaisher had opened communications on the

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* I am glad, however, to notice that some independent study of the affected mucous membrane was made by Dr. Beale, with his eminently skilful use of the microscope, and that the results of this work have since been published by him as contributions in the Medical Times and Gazette.—J.S.

† See section 5 of Boehm's classical work "die kranke Schleimhaut in der "Asiat. Cholera," Berlin, 1838.—J.S.

‡ Dr. Thomé's observations are contained in a paper, published (with date of "end of November 1866") in Virchow's Archiv, for last February. Dr. Klob's, dated "December, 1866," are published as a pamphlet with the title "Pathologisch-anatomische Studien über das Wesen des Cholera-processes." Professor Parkes gives me the interesting information that he recognizes in the descriptions and plates of these writers the "corpuscles" or "granules" which attracted much of his attention in 1849, and are often spoken of by him (with no suspicion of their being of vegetable nature) in this paper, then published in the London Journal of Medicine, "on the intestinal discharges in Cholera;" also that he had noticed these bodies again in 1865 and 1866, when they vividly recalled the former observations to his mind; and that he noticed like bodies once in the sediment of a first cholera urine.—J.S.

Scientific investigations of cholera.

subject with observers in many different parts of the country, and I hoped to have in my Appendix a report from him on some first instalments of evidence. Unfortunately, however, about the time when he might have been reviewing his materials for such a report, serious illness (from which he is even yet not fully recovered) obliged him to suspend the inquiry.

In connexion with my account of the scientific proceedings of the department in relation to cholera, I should be glad if the time had come for stating, with any pretensions to finality, the corroborations or modifications of doctrine which, doubtless, will have to be recorded when this fourth great visitation of the disease shall have run its fatal, but most instructive course. To write now in any such sense would be premature. The studies of the disease, so far as they have gone, promise, I think, to result in considerable augmentations of knowledge; but hitherto, in my opinion, they are not so far advanced, either in this country or abroad, that I need discuss their probable bearing on previous doctrine. Instead of doing so I attach a few critical remarks to some of the papers in my Appendix. And perhaps, if circumstances should justify any further statement in questions which are now open, I may be permitted to add a postscript to this report.

Action of local authorities.

It is neither in my province nor in my power to submit any particular statement of the action taken by local authorities throughout the country in execution of the Diseases Prevention Act and of the regulations thereunder issued. It is not the practice for any local authority, except on special application, to report its action to the Privy Council; but in cases of inaction, communications are apt to be made by persons who feel themselves aggrieved; and, when I look to the comparatively small number of complaints of inaction which were made after the Order in Council, as well as to some more positive evidence in the matter, I think it may perhaps be assumed that generally the action of local authorities satisfied their constituents, and accorded in great part with the spirit (if not so much with the letter) of their

Action of local authorities.

Lordships' regulations.* If I may judge from the experience of London, voluntary action of all kinds was, as usual, ready to aid the authorities.† And as no place in England suffered more heavily than the Eastern districts of the metropolis, I may particularly refer to the very valuable services which were here rendered by the London Hospital, always among our foremost charities, and by Miss Sellon's temporary hospital in Whitechapel. Grateful acknowledgments are also due to the Seamen's Hospital Society, which from the middle of August voluntarily undertook the daily medical visitation of all ships in the metropolitan portion of the port of London, distributing medicines as required, and removing to the cholera ship "Belle-Isle," the cases which needed hospital treatment.

Quarantine against cholera.

I have nothing of medical importance to state with reference to proceedings taken here against cholera under the Quarantine Act. Indeed in my last report I showed the impossibility of fulfilling for England the conditions of a successful quarantine against cholera. But as I also then admitted "that quarantine, conducted with extreme rigour

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* The largest exceptions to the rule were probably in regard of the regulation which provides for systematic house-to-house visitation in suffering districts, and of the regulation which enjoins the speediest possible interment of the dead. No doubt these two regulations are the most difficult of all to carry into effect; but the Diseases Prevention Act expressly provides for their being made. It is, in my opinion, desirable that local authorities should take pains to ascertain for themselves how very much real help and comfort is withheld from suffering districts when effective and systematic house-to-house visitation is not established; and also that they should better appreciate how very much alarm and horror are excited in epidemic times by any prolonged retention of dead bodies. Two or three cases of flagrant neglect of the regulation as to burials were reported to the department within a few days after the issuing of their Lordships' regulations; but in extenuation it must be admitted that local authorities, at that time, might not fully have completed their arrangements for speedy burial.—J.S.

† During August and September numerous applications were made by local authorities to the War Office for the loan of hospital-tents and ambulances for the use of persons suffering from cholera. As "the Sanitary Act, 1866," which was passed on August 7th, gives power to metropolitan boards and vestries, and in the country to sewer authorities, to provide temporary hospitals, these applications were not indiscriminately entertained; but whenever exceptional circumstances existed (such as those of some places during hop-picking) the War Office, upon their Lordships' recommendation, granted the required accommodation, subject to the price or hire of the tents and ambulances being paid.—J.S.

Quarantine against cholera.

" and with the precision of a chemical experiment, will keep " cholera out of any part of Europe in which the extremely " difficult conditions can be absolutely fulfilled," so it may be convenient that I now place on record two cases, brought under my notice during the year, where quarantine seems to have been effectual. A despatch to the Foreign Office, from Her Majesty's Minister at Florence, dated October 26th, 1866, gives the following statement. "The outbreak of cholera at " Palermo has taken place under circumstances which merit " some remark. Last year cholera prevailed at Naples " Malta, Marseilles, and other places with which the inter- " course with Sicily is most frequent; but a quarantine of the " most stringent, not to say exaggerated form, was enforced " throughout the island, and the disease never appeared there. " The same thing occurred again this summer, and notwith- " standing the prevalence of cholera at Marseilles, Genoa, and " Naples, it did not make its appearance in Sicily, where the " quarantine was, as before, rigidly enforced. Then came " the disturbances at Palermo, and the necessity of bringing " troops at once from Naples, and of landing them without " delay. In a few days it begun to be whispered that cases " of cholera had occurred amongst them and, shortly after- " wards, some of the towns-people were attacked; till, by " the last returns, above a hundred deaths had taken place " within the twenty-four hours." The following facts are taken from a despatch addressed on 23rd April 1866 by the Lieutenant-Governor of Dominica to the officer administering the Government of the Leeward Islands; a copy of which was received by my Lords from the Colonial Office. A brig left Marseilles in the autumn of 1865, bound for the French island of Guadeloupe, and while she was on her voyage a boy on board died of cholera; the captain kept some of the boy's clothes, and on arriving at Pointe-a-Pitre in Guadeloupe sent them to be washed. The laundress was attacked with cholera; other cases quickly followed; and soon the disease spread throughout the island. Up to February 19th, 1866, out of a total population of 138,669, there had been 10,808 deaths from cholera registered, including no fewer than 1,934 in Basse-terre, the capital, which

Quarantine against cholera.

has but a population of 9,576; and the commander of a French ship of war which called at Dominica about the end of March informed the Lieutenant-Governor that, by that time, about one-third of the population of the capital, and about a ninth-part of the whole population of the island, had perished from cholera. Such was the magnitude of the danger which threatened the neighbouring island of Dominica, and which was, if possible, to be averted. Dominica is 22 miles from the main island of Guadeloupe, but only 15 from some of its dependencies, certain small islands called "Marie Galante," above-mentioned, and "les "Saintes." Up to the beginning of November 1865, the communications between these small islands and the north end of Dominica was constant, almost daily; the markets of Marie Galante were supplied with provisions and vegetables from Dominica; and carpenters, bricklayers, and others living in Dominica, went across the narrow channel to work at Marie Galante, leaving their wives and families at home. It was on the 2nd of November that a rumour reached Dominica that cholera had broken out at Pointe-a-Pitre in Guadeloupe. On the 4th the Lieutenant-Governor of Dominica sent to the Governor of Guadeloupe for information; and feeling persuaded, after the return of the messenger, that it really was an outbreak of cholera, he on the 9th declared Pointe-a-Pitre in quarantine. Afterwards, when news arrived that the disease was spreading through the island of Guadeloupe, the whole of the island and its dependencies were placed in quarantine. Despite this precaution, a boat from Marie Galante filled with persons, some still healthy and some sick with cholera, succeeded in reaching Dominica. A street-guard was placed by the Lieutenant-Governor on the village at which these persons had landed, and for the future, "health-guards" with loaded muskets were stationed at every place round the island where landing was possible, to prevent persons from Guadeloupe from setting foot on the island. These measures of precaution were entirely successful, and, so far as I can gather from the despatch, only two persons died of cholera in Dominica; and these were two boat-men who landed from the boat mentioned above, and died on the beach, close to the village which was subsequently isolated.

THE SANITARY ACT, 1866.

The Sanitary Act, 1866.

In the year 1866 an event occurred of greatly more importance to the public health than any of these departmental proceedings which have claimed first mention in this annual report. The Legislature, namely, on the motion of my Lords, and with particular reference to defects which it had been my duty to report, took into consideration the state of the sanitary law of the country, and saw fit to amend and enlarge the law by enactments of such stringency and comprehensiveness that the date of this change—the passing of the Sanitary Act, 1866, marks the beginning of a new era in the progress of sanitary reform. Fully to set forth the immense public gain which this recent legislation represents, I should have to comment on each separate section of the Act with more detail than would here be admissible; and I can only venture to advert in a few words to some of the most important of the new enactments. Such are the following:—§ 11, which provides universally for supply of water; § 19, which enlarges in several directions and with singular advantage the previous legal definition of "nuisance;" § 20, which renders it obligatory (no longer optional) for local authorities to make inspection of their districts, and, where nuisances exist, to suppress them; §§ 22–30 and 37–39, directed against various kinds of personal conduct, and various deficiencies of accommodation, which lead to the spread of contagious disease; § 35, which gives to town-authorities the invaluable power of regulating the so-called tenement-houses of the poor; not least, § 49, which creates a power of appeal to central government from the inaction of local authorities, and provides that, where sewers are not duly provided, or water not duly supplied, or nuisances not duly removed, there, in the last resort, the central government and the Court of Queen's Bench can enforce the neglected local duty. And how vastly the sphere

The Sanitary Act, 1866.

of usefulness of local authorities is widened by the altered definition of "Nuisance" will be evident when it is observed, first, that overcrowding (certainly among the foremost sanitary evils of the country) now for the first time falls technically within that definition; and, secondly, that, under another extension of the term, the industrial millions of the country get the great boon of having all factories, workshops, and workplaces not yet under special Acts, made subject to the sanitary supervision of local authorities; and this not only in respect of uncleanliness and overcrowding, but in respect also of the often very fatal agency of "gases, "vapours, dust, or other impurities generated in the course "of the work." The Act, having passed only on August 7th, could not be used with much effect in relation to last year's special emergencies: its value of course was chiefly prospective; converting a law which was grievously defective into one which contains nearly all requisite provisions for the public health. For detailed evidence as to the amount of good which may be realised under the new law, I may best refer to the statements contained in my past annual reports, especially in the last five of them: on the one hand, as to the preventable diseases of the country, and the spreadings of contagious disease; on the other hand as to the influences which have been operating against human life, in the non-administration and insufficiency of the nuisance law, in the wretched house-accommodation of the poor, and, not least, in the sanitary circumstances of industry. The broad effect of this most beneficent legislation may, I believe, be summed up in this simple fact, that influences which have hitherto been causing about a quarter of our total mortality are now for the most part brought within control of the law.

Water companies in relation to the public health.

It has seemed to me however, which I think it my duty to mention, that one important exception to this satisfactory state of the law was brought to light in connexion with last year's outbreak of cholera in London. I refer to the relations subsisting, and particularly in one respect, between commercial water companies and the public. It will be seen in Mr. Radcliffe's report that the East London Water

Water companies in relation to the public health.

Company, through its engineer, acknowledges to having acted in contravention of the fourth section of the Metropolis Water Act, 1852, by distributing for public use a water (and a most improper water) which had not passed through its filter-beds; and Mr. Radcliffe adduces very strong evidence to show that the East London outbreak of cholera was occasioned by this illegal and most culpable act. It seems to me that the public is hitherto very imperfectly protected against certain extreme dangers which the mal-feasance of a water-company, supplying perhaps half a million of customers, may suddenly bring upon great masses of population. Its colossal power of life and death is something for which till recently there has been no precedent in the history of the world; and such a power, in whatever hands it is vested, ought most sedulously to be guarded against abuse.

I venture to submit that the penalty of 200*l.* which the Metropolis Water Act imposes for a violation of its provisions is utterly incommensurate with the magnitude of the public danger which a lax administration of the law represents: and it is certain that in 1852, when this statute was enacted, the state of science did not yet enable the Legislature to know, as it must now know, that a water company distributing sewage-tainted water may, in a day, take hundreds of lives. In theory, no doubt, it would appear that Lord Campbell's Act (9th and 10th Vict., cap. 93) must apply to cases of this description—that actions for damages are maintainable against water-companies by the families of persons whom any wrongful act, neglect, or default of such companies has thus killed; and of course, that the person himself, if injured but not killed, can have his own action for damages. But the difficulties in taking any such course at law would, I believe, be extreme. The proof generally as to the epidemic might be complete; it might be shown to the satisfaction of a jury that the outbreak, in mass, had been caused by the distribution of a certain water, which some commercial company, with ignorant or profligate laxity, had suffered to be polluted with sewage; but, with all this clearly shown as to the epidemic generally, it might still be scarcely possible for any individual victim of the company's mal-feasance to prove (if this had to be proven) that his particular attack came from the direct operation of that and no other cause. It is probably from a perception of this difficulty that, so far as I know, no proceedings for damages have ever yet been taken against a water-company by persons whom the water has injured. And as the deterrent influence of such personal proceedings does not operate in aid of the general law, it is, I submit, especially to be desired that any wilful or neglectful distribution of polluted water to the public should be punishable under the statute law in a very much higher degree than at present.—March 31st, 1867.

Water companies in relation to the public health.

POSTSCRIPT.

Cholera Conference at Weimar.

August 3rd, 1867.—Since my above report was presented, and while it and its appendix have been printing, I have had the great advantage of comparing notes on the subject of cholera with the foremost of my fellow-workers on the Continent. Four leading epidemiologists of Germany—Professors Griesinger and Hirsch of Berlin, Wunderlich of Leipzig, and v. Pettenkofer of Munich, had proposed that an international medical conference should be held at Easter at Weimar; where persons who officially or otherwise had been much busied with the study of cholera in their respective countries might meet, from different parts of Europe, to exchange information as to past experiences of the disease, and to consult together, in the interests of the public health, both as to the best principles of defence against cholera, and also as to those prospective scientific investigations by which the knowledge of right principles might be advanced. The distinguished conveners of this meeting honored me with an invitation to attend; and my Lords, rating very highly the benefits which such conferences may give, authorized me to accept the invitation. This accordingly I did, and had the pleasure of spending several days, according to the programme, in interchanging experiences and suggestions with men whom it was an official advantage to me to consult.

Cholera Conference at Weimar.

Germany and England may between them claim the credit of having built up nearly all the definite knowledge which is yet possessed as to the pathology of our great modern pestilence. Each of the two countries has worked, of course, with some distinctive peculiarities of its own; and the time has now come when a thorough interfusion of the two respective stores of attainment is necessary for the progress of either country, and, therein, for the common good of mankind. I may venture to say that those whom I met at Weimar welcomed the opportunity which my presence afforded them of learning more familiarly than before the very important sanitary experiences of England, including those (not the least important of the number) which are recorded in this volume in Dr. Buchanan's and Mr. Radcliffe's reports; and on the other hand I can most strongly testify that the conference had before it, from continental and chiefly German observers, facts upon facts, of high importance and impressiveness, as to those parts of the great subject-matter which have hitherto been least cultivated in England.

As the full reports of the proceedings of the conference will shortly be published, I need not attempt any circumstantial account of the communications to which I refer, but may very briefly describe their general bearing.

Local relations of cholera to soil and its variations of state.

First and especially, the doctrine for which Pettenkofer has long contended, that the "caprices" of cholera, as to its places and times of prevalence, have their respective roots in different qualities and different states of local soil, was illustrated by many examples. One such, as to places, was a geological map of Thuringia, with the epidemics of 1866 marked upon it; where at a glance it was seen that the epidemics in that large and varied area had been almost exclusively on one geological formation. And equally striking in the same sense were some illustrations on a smaller scale (as from Bautzen, Zwickau, Altenburg, Apolda, Würzburg, and other places) showing extremely definite boundaries of non-prevalence or minor prevalence of cholera, coincident with equally abrupt distinctions of local soil. Similarly as to the "time-caprices" of the disease, facts of considerable interest were adduced (especially from St.

Local relations of cholera to soil and its variations of state.

Petersburg, Lübeck, and Pesth) in support of Pettenkofer's view, that the different behaviour of cholera at different times in the same place is determined by temporary differences of soil: *i.e.*, by variations, in different seasons, in the thickness of superficial porous soil which is left unoccupied by "ground-water," and consequently penetrable by air: variations which in many cases can be inferred from the varying water-level of surface-wells.

Disinfection against cholera.

A next very striking set of reports related to some supposed successes, and some unquestionable non-successes, of chemical disinfection, where it had been used in the hope of preventing or arresting epidemics of cholera. I had had the pleasure of laying before the conference the very remarkable account, which Dr. William Budd of Bristol had recently published,* of the almost entire exemption of that place from cholera in 1866, under a system of disinfection which the medical officer, Mr. David Davies, to his great credit, had applied with singular assiduity and completeness. This case, taken by itself, had certainly a very hopeful complexion; but nothing could be more disheartening than some counterstatements which were made; and after them the only hope I could retain in the matter was that perhaps the good to be got from disinfection in favourable cases was not quite fully represented by the failures of Leipzig, Stettin, Erfurt, and other places in Germany. In Leipzig Professor Victor Carus, as a volunteer for his town, had been all that Mr. Davies was in Bristol; the town was divided into 100 disinfection districts, each with an officer who visited daily for disinfection with sulphate of iron every house in his district; over these district officers were four young chemists, constantly inspecting under Dr. Carus's instructions to see that all disinfection was satisfactory; and Professor Carus himself, besides superintending all this work, personally every day visited all houses which had cholera in them: disinfection had never before been tried in Leipzig, yet never had Leipzig suffered so severely from cholera. In Stettin all choleraic discharges were treated with lime and chloride of lime; but, in all the

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* British Medical Journal, April 13th, 1867.—J.S.

13 cholera epidemics of the town, never had the disease been so severe. In Erfurt carbolic acid was used so lavishly that the very drinking-water reeked and tasted of it; testifying by-the-bye to a poisonous proximity of wells to cesspools; but cholera was three times more fatal there than it had ever been.

The "cholera fungus."

A third great centre of interest consisted in communications as to the so-called cholera fungus. Both Dr. Thomé and Professor Klob were present; and two of the leading mycologists of Germany, Professors Hallier of Jena and De Bary of Halle, were associated with these gentlemen as a committee, to make in common with them a statement and appreciation of the facts which had been observed. The report, drawn by Professor De Bary, was, in substance, this: "Both observers find in cholera evacuations and in the "intestinal mucus of the dead body definite organic struc-"tures, zoo-gloea, consisting of excessively fine granules, "clustered more or less densely in the interspaces of a jelly, "which more or less abundantly surrounds them. The "granules divide and sub-divide themselves, to form beaded "threads, which interlace in immense numbers into felted "masses in the mucus. The further development of these "organisms has yet to be determined. Dr. Thomé, by sow-"ing them, has got after some time larger round cell-like "bodies, which rapidly multiplied, and also abundant fila-"mentous fungi (*cylindro-tænium*) on which grew cylin-"drical spores, capable of developing again to filaments. "Views as to the mutual relations of these cells, filaments "and spores, are for various reasons to be expressed only "with reserve, and the study of them is so immensely "difficult, that definite results cannot at once be expected. "The significance of these fungi would be greatly increased "if they should be shown to exist in the blood as well as "in the bowels of the sick: but this, though from some "inquiries it seems probable, must at present be deemed "questionable." To this quotation I may add that I have more recently been favoured with a letter from Professor Hallier (date June 18th) informing me that he has now himself succeeded in finding a fructifying fungus in choleraic discharges; and that by 44 different experimental cultivations he has made himself cognisant of all its forms. He mentions that it requires a high temperature (R. 25°–35°) for its fructification, and therefore cannot be of European origin.*

Present practical knowledge of cholera.

With the present opportunity of adding a few supplementary remarks to my report, and particularly with the results of the Weimar conference before me, I am led to consider once more whether the additions, which our previous knowledge of cholera has hitherto during this epidemic received, are such as to change in any respect the principles on which I have heretofore advised against cholera, or in any way to require that I should make other practical recommendations than those which were last year issued from this department, and are now subjoined in my Appendix After giving to this question the best consideration in my power, I answer it, though with very mixed feelings, confidently in the negative.

Medical treatment of cholera.

Doubtless it is lamentable that one should still have to speak almost with despair of the medical treatment of developed cholera. But so it is. The task continues to be, as from our first acquaintance with the disease it has been, an almost hopeless task for the practitioner. The experience of renewed epidemics, the studies of 35 years, have in this respect done little more than warn us from various kinds of hurtful activity, and teach us that at present our utmost power is but perhaps some very little ability of palliation.† In the treatment of incipient cholera, there might certainly

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* As this Report is on the point of being printed off (August 3rd) I receive Professor Hallier's finished monograph on the fungus, and shall subjoin a brief abstract of this most interesting paper. See App., pp. 321–5.—J.S.

† If among recent publications there be hinted some partial exception to the otherwise universal helplessness of medicine in cases of choleraic collapse, the exception neither in kind nor in degree is such that the ravages of the disease, in relation to masses of population, are likely ever to be much affected by it. In saying this I refer particularly to the method of saline aqueous transfusion. Not only are competent dexterity and experience wanted for this palliative treatment of collapse to have any fair chances of success, but also (with a view to immediate renewed transfusion when required) the patient has to be incessantly watched with a minute vigilance which cannot possibly be got where large numbers are concerned. See Mr. Little's paper on the subject in vol. 3 of the London Hospital Reports.—J.S.

Medical treatment of cholera.

seem more room for hope; but competent physicians are not agreed that even here their art has much true efficiency against the disease. Practically then, more and more, as facts like the above become notorious, the business of resisting cholera on any large scale resolves itself into aims of prevention. And in contrast with the powerlessness of curative medicine, the preventive power which we possess is among the happiest possessions of science.

Prevention of cholera.

Yet here, as in the former respect, though for reasons which are widely different, I have again nothing new to advise. That which for public use in this country I believe to be, without any shadow of doubt, now as for long past years, the all-important principle of cholera-prevention: the principle that, for us, cholera derives all its epidemic destructiveness from filth, and specially from excremental uncleanliness: this of course may be iterated and re-iterated, with new and newer illustrations, but the utmost prominence which I can give to it was given in my last year's memorandum, and new knowledge neither permits me to express myself less strongly on the subject, nor enables me to express myself more strongly, than I have done even years and years ago.

The doctrine of the cholera-fungus—the alleged discovery that the specific zymosis of cholera, the bowel-fermentation in respect of which it is contagious, has essentially associated with it, and perhaps as its immediate cause, a definite multiplying organic form, is not only of the utmost philosophical interest, but, should it be substantiated, may also hereafter be found capable of very important practical application. For as one reflects on the doctrine in all its bearings, specially as one considers Professor Hallier's conjecture (based on botanical considerations) that perhaps the cylindrotænium is originally a blight of rice,* something like a clue is for the first time suggested for investigations which may hereafter conduce to the prevention of cholera in its eastern centres of origination. But for us in Europe, meanwhile, the doctrine may be absolutely sterile of results. In its broad signification, indeed, the discovery would not be a surprise to pathologists. The possibility has for some years past been recognized that perhaps every fermentatory or putrefactive change of organic material has with it, and may be as its cause, a characteristic molecular living thing;* and, however sure it may have become that the choleraic zymosis answers to that possibility, it remains yet untried whether disinfection (which after all is but a doubtful resource) can deal better with the process on that basis than on the purely chemical basis which has hitherto been the ground of our proceedings.

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* This impressive hint is contained in a little notice which Prof. Hallier gives of his culture-experiments in No. 30 (1867) of the Berlin Centralblatt. See also App., pp. 321–5.—J.S.

Prevention of cholera.

In the long chain of cause and effect through which the rise of a certain ferment in India becomes the predestining force for subsequent outbreaks of pestilence in Europe, we see at present only one link where we may strike with the certainty of preventive effect. Whatever may be the explanation of the fact, at least empirically we know that here in Europe the pestilence rages only where there are definite sanitary evils. This knowledge remains unchanged; and unchanged remain also our practical means of applying it. Between different epidemiologists there may be differences, even strong differences, of opinion, as to the intimate nature of some of the steps by which the Asiatic influence becomes able to operate on the individual dweller in some English town; but practically all would unite in saying that the chain of evil is abruptly broken wherever thorough cleanliness prevails. The details of the contrary condition are beyond measure disgusting to write about; but more disgusting by far it would be that they should continue through not being identified. It cannot be too distinctly understood that the person who contracts cholera in this country is *ipso facto* demonstrated with almost absolute certainty to have been exposed to excremental pollution; that what gave him cholera was (mediately or immediately) cholera-contagium

Relation of cholera in England to faults of drainage and water-supply.

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* See in Sixth Annual Report, pp. 151–2, foot note on the experiments of Schröder and Pasteur, as to the connexion generally of fermentatory and putrefactive changes with the presence of characteristic organisms, and on the interest of these experiments to zymotic pathology.—J.S.

Relation of cholera in England to faults of drainage and water-supply.

discharged from another's bowels; that, in short, the diffusion of cholera among us depends entirely upon the numberless filthy facilities which are let exist, and specially in our larger towns, for the fouling of earth and air and water, and thus secondarily for the infection of man, with whatever contagium may be contained in the miscellaneous outflowings of the population. Excrement-sodden earth, excrement-reeking air, excrement-tainted water, these are for us the causes of cholera. That they respectively act only in so far as the excrement is cholera-excrement, and that cholera-excrement again only acts in so far as it contains certain microscopical fungi, may be the truest of all true propositions; but whatever be their abstract truth, their separate application is impossible. Nowhere out of Laputa could there be serious thought of differentiating excremental performances into groups of diarrhœal and healthy, or of using the highest powers of the microscope to identify the cylindrotænium for extermination. It is excrement, indiscriminately, which must be kept from fouling us with its decay.

Prevention of cholera by proper sanitary constructions.

And thus it is that my practical advice remains substantially what it has been for years. The local conditions of safety are, above all, these two:—(1) that, by appropriate structural works, all the excremental produce of the population shall be so promptly and so thoroughly removed, that the inhabited place, in its air and soil, shall be absolutely without fæcal impurities; and (2) that the water-supply of the population shall be derived from such sources, and conveyed in such channels, that its contamination by excrement is impossible.

What good results are got even by rough approximation to those sanitary standards has already been abundantly shown here. The way in which the southern districts of London, with their three-fourths of a million of population, have gradually gained comparative immunity from cholera in proportion as their two water-companies have ceased to distribute sewage-tainted water among them, is matter of familiar history. And the results to which I have already referred, as found by Dr. Buchanan in various towns where works of drainage and water-supply have been provided—results which may be read at a glance in column E. of the table [pp. 273–4] are further illustrations to the same effect.

That cholera is still a terror to Europe shows how scantily such illustrations are yet understood. Even here in England the objects which I have named as essential are at best but rarely fulfilled; indeed for vast numbers of our population scarcely rudimentary endeavours have been made to attain them. Town after town might be named, with myriad on myriad of population, where there is little more structural arrangement for the removal of refuse than if the inhabitants were but tented there for a night. The case of the water-supply is no better: my reports are incessantly showing the too frequent foulness of private supplies; while, as regards public water-supplies, such as generally are in the hands of commercial companies, it has again and again been shown (and seldom more pointedly than in the present volume) that their conveniences and advantages are countervailed by dangers to life on a scale of gigantic magnitude, unless those who administer the supplies act under a very deep sense of responsibility.

Typhoid fever and much diarrhœa governed by same influences.

Cholera, ravaging here at long intervals, is not Nature's only retribution for our neglect in such matters as are in question. Typhoid fever and much endemic diarrhœa are, as I have often reported, incessant witnesses to the same deleterious influence; typhoid fever which annually kills some 15,000 to 20,000 of our population, and diarrhœa which kills many thousands besides. The mere quantity of this wasted life is something horrible to contemplate, and the mode in which the waste is caused is surely nothing less than shameful. It is to be hoped that, as the education of the country advances, this sort of thing will come to an end; that so much preventable death will not always be accepted as a fate; that, for a population to be thus poisoned by its own excrement, will some day be deemed ignominious and intolerable.

APPENDICES.

DIRECTIONS and REGULATIONS issued in 1866, in relation to ASIATIC CHOLERA, by the LORDS of the COUNCIL, acting under the DISEASES PREVENTION ACT, and OFFICIAL MEMORANDA circulated in connection therewith.

a. DIRECTIONS and REGULATIONS of July 20th, 1866, for Places not within the Metropolis.

I.—*Preliminary.*

Preliminary arrangements.

Forthwith on the issuing of the present regulations, the Clerk of every Board of Guardians shall summon a special meeting of the Board, in order that the present regulations may be brought before them, and that the Board may make (as they are hereby required to do) such preliminary arrangements as will enable them, if sudden need shall arise, to carry the following regulations into immediate effect; and the Board at such meeting shall direct the Clerk, by instructions to the Medical Officers, and by circular letters of request addressed to all legally qualified Medical Practitioners in the union or parish, and in such other ways as the Board may think necessary, to take measures for causing the Board to be made acquainted with any presence of Cholera or unusual amount or severity of Diarrhœa in the union or parish, or any part of it, if such be existing or should thereafter exist; and the Board, if apprised of any such presence of Cholera or Diarrhœa, shall thereupon forthwith, so far as the circumstances require, do the several things herein-after ordered:

II.—*When Cholera is in an Union or Parish.*

Meetings of the local authority.

1. Every Board shall make arrangements for meeting, in districts where the disease is actually prevailing, daily, either in a body or in one or more commitees, according to the exigencies of the district, for the purpose of exercising the powers conferred upon them by the Act.

Place of meeting.

2. The meetings may be held at the ordinary Board-room, and, where necessary, at such other places as shall appear to be most convenient for dealing with the disease, and the Board shall cause proper minutes of all proceedings to be made and duly recorded.

Appointment of Medical Adviser.

3. Where the Union or Parish forms part of any town of more than 60,000 inhabitants, or contains a town of more than 40,000 inhabitants, according to the report upon the last Census, or where several parts of the Union or Parish are at one time suffering from Cholera, the Board shall appoint some legally qualified Medical Practitioner, to attend at the meetings and render his advice thereat, and superintend all the medical arrangements for preventing and treating the disease.

Appointment of Medical Visitors.

4. In each district in which Cholera is present, or, if the quantity of work to be done renders it desirable to subdivide the district, then in each of such subdivisions a legally qualified Medical Practitioner shall be put in charge of the district or subdivision for the medical purposes of these regulations; and to each such Medical Practitioner shall be allotted all needful Medical Assistants and such other Assistants as the Board see fit.

Such District Medical Practitioner, or one of his Assistants, shall at least once daily visit those parts of the district which are inhabited by the poorer classes and wherein the disease is, and shall there inquire at every house as to the existence of Diarrhœa or Cholera, and shall enter in a book to be kept for the purpose the facts as to all cases he may meet with, and shall without delay give, or take the proper steps for causing to be given, all necessary medical assistance to the sick. And the Medical Practitioner or Assistant shall, when visiting the part assigned to him, be provided with medicines for immediate administration in urgent cases, and shall be held to be in medical charge of all cases of Diarrhœa or Cholera with which he may meet until he is relieved by such other provision for their medical attendance as may be made or sanctioned by the Board.

Their report.

5. Such Medical Practitioner shall, by transmitting his above-required book, or otherwise, report daily to the Board of Guardians, or to the Committee of the district for which he acts, the result of his own and his Assistants' inquiries, and shall make such suggestions as to the state of the district as he shall deem advisable.

Board to report nuisances.

6. In places where the Board of Guardians are not the Nuisance Removal Authority, the Board shall, without delay, cause report to be made to such authority, and, if the Board see fit, shall complain to the Justices, of every case where any Committee, Medical Practitioner, or Assistant, employed by the Board, shall find any nuisance injurious to health existing in any premises visited by them.

Visitors to report cases of destitution to the Relieving Officer.

7. The visitors shall, where they find it expedient, communicate to the Relieving Officer of the district any case of destitution requiring relief, which is not entered in his relief list, and such officer shall forthwith visit the same and give such relief as in his judgment the case shall require.

Board to provide dispensary stations.

8. The Board shall provide a sufficient number of dispensaries, to be open night and day, at convenient places within their district, with an adequate supply of such medicines, medical appliances, and disinfectants, as their Medical Adviser shall recommend, and with a legally qualified Medical Practitioner or skilled Assistant always in attendance at each; and such medicines, medical appliances, and disinfectants, shall be dispensed without charge by such Medical Practitioner or Assistant to persons bringing orders for the same from the District Medical Practitioners, and to other persons who apply for immediate medical treatment. And the names and addresses of all such applicants shall be sent to the District Medical Practitioner of the place in which they reside.

Board to supply medical aid to poor Cholera Patients.

9. In every case of Cholera or Diarrhœa, where the patient is not under medical care and treatment, the Board shall cause medical assistance to be rendered with the utmost expedition, and such aid, and comfort, nourishment, and accommodation, as the circumstances of the case will admit, with the object of restoring health.

To provide nurses.

10. The Board shall provide competent nurses to aid every District Medical Practitioner in his attendance upon the patients suffering from the disease.

To provide hospitals in certain cases.

11. When the Medical Adviser recommends, the Board shall, with as much despatch as practicable, provide fit and proper accommodation for the reception of such patients as have no home, or cannot properly be treated at home, and may with advantage to themselves be removed, and shall cause the same to be provided with all appliances, medicines, furniture, and other things necessary for the emergency, and shall appoint a legally qualified Medical Practitioner, with or without Assistant, as the case may require, to attend to the same.

To provide for the separation of the sick from the healthy in the same dwelling.

12. If Cholera or Choleraic Diarrhœa exist in any dwelling whereof the Medical Practitioner reports that the sick and healthy cannot therein be properly separated, the Board shall forthwith cause adequate accommodation to be procured for the reception of the healthy; and, when the Medical Practitioner recommends that the sick person shall not be removed, but that the

healthy shall be removed from the same room in which the sick person is lying, the Board shall cause the other inmates of such room to be removed to some convenient place of reception.

To provide disinfectants and to cause things and places to be disinfected.

13. The Board shall, in dwellings where Cholera or Diarrhœa exists, cause proper disinfectants to be used in sufficient quantities for the purpose of disinfecting the discharges from the sick, and the bedding, clothing, and other things thereby infected, and the utensils and privies in which such discharges may have been received.

To cause infected goods to be destroyed.

14. The Board shall cause every article of clothing, bedding, or furniture which shall have been infected with any such discharge, and which they shall find incapable of being speedily disinfected, to be forthwith destroyed, the Board within a reasonable time replacing all such articles, or paying the reasonable value to the owner.

To procure good water in place of that which is polluted.

15. If it be shown to the Board that any drinking-water used in their district is polluted, they shall take measures, with as much expedition as possible, for procuring wholesome water to be supplied in its stead, so far as the case requires, to the inmates of the houses in their district, and for preventing, as far as possible, the further use of the polluted water. And every Board owning or having possession of any waterworks for the supply of water shall cause the reservoirs, cisterns, pipes, pumps, and other apparatus belonging thereto, to be carefully examined, cleansed, and purified, and other necessary measures to be taken so that the water may be supplied without impurity.

Provision for burials.

16. The Board shall make due arrangements with undertakers and with the proper authorities of the churchyards, burial grounds, and cemeteries of their district, so that coffins may be ready to be supplied immediately on demand and interments speedily taken place in the cases of deaths arising from Cholera or Diarrhœa, and the Board shall, when informed of any such death, cause the corpse to be buried with the earliest possible despatch.

Assemblage of persons at waking the dead prohibited.

17. Where any death shall occur from Cholera or Choleraic Diarrhœa, no collection of persons shall assemble in the room where the corpse is, and no waking of the dead shall be allowed.

Corpses to be kept separate from the living.

18. The Board shall cause the immediate removal, from any room which living persons inhabit, of the corpse of every person dying from Cholera or Choleraic Diarrhœa, until the time of its interment, and shall cause such means to be adopted for preventing the spread of infection from the corpse as their Medical Adviser shall recommend.

Guardians to take precautions as to ships and vessels lying within their Union or Parish.

19. *If the Guardians shall be informed that Cholera or Choleraic Diarrhœa exists, or within three days previously has existed, in any Ship or Vessel which may be lying within their Union or Parish, they shall cause the same to be forthwith visited, inspected, and otherwise dealt with, according to the circumstances of the case, in like manner as if it were an inhabited house on shore, and shall give all such medical and other directions in reference to the persons in such Vessel or Ship, as shall be requisite for preventing the spread of the disease, and for the disinfection or disposal of any things which may be infected or may have been exposed to infection, subject always to the provisions of any Order of Council issued under the Quarantine Laws for the time being in force in such Union or Parish.*[*]

Provision for ships or vessels in parts or arms of the sea having Cholera on board.

20. *The captain, master, or other officer in charge of any Ship or Vessel lying in any part or arm of the sea within the jurisdiction of the Admiralty, but not comprised within any Union or Parish, in which Ship or Vessel any case of*

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[*] Repealed by Order of Council of Aug. 25, 1866.—J.S.

Cholera or Choleraic Diarrhœa exists, or within three days previously has existed, shall obey every direction in writing addressed to him by the Guardians of the nearest Union or Parish signed by their Chairman or Clerk, in reference to the Medical and other treatment of the sick and other persons on board, with the view of preventing the spread of the disease, or to the disposal of the body of any person dead of the disease, or to the disinfection and disposal of the things infected with the disease, or otherwise to the removal of any unhealthy condition of the Ship or Vessel.

Statistical returns to be obtained.

21. The Clerk of the Board shall every Monday send by post to the Medical Officer of the Privy Council, a return of the number of new cases of Diarrhœa or Cholera which have, during the week ended on Saturday midnight last, come under the cognizance of the Board, and of the number of recoveries, and the number of deaths, with such other particulars as such Medical Officer shall from time to time require. The Return shall be in the following form, or to the like effect :—

____________________ *Union or Parish.*

Weekly Return of Cases of Cholera or Diarrhœa for the Week ending on Saturday last.

New Attacks during the Week - - - - -
Deaths during the Week - - - - -
Recovered during the Week - - - - -
Total Number of Cases now under treatment - - -

*Date*____________________1866.

(Signed)____________________________*Clerk to the Board.*

Board to publish notices.

22. The Board shall, from time to time, as they shall find expedient, issue, publish, and distribute in placards, hand-bills, or other communications, such admonitory notices to the owners and occupiers of property within their district as to the provisions of the Acts for the Removal of Nuisances as shall appear to be requisite, and in a like manner publish all such medical advice and such directions and instructions as in their judgment shall be necessary to afford aid to persons attacked with Cholera or Diarrhœa, or for the carrying of these Regulations into execution, and inform the public what special arrangements have been made for affording medical or other assistance in the district.

General Order and exhortation for aid to the Board.

23. All Officers, Assistants, and Servants of the Board are ordered, and all Medical Practitioners and other persons inhabiting within the district of the Board are requested, to supply information and give their aid to the utmost of their ability to the Board in the execution of these regulations and directions.

Provision for Parishes not in Union or under a Board of Guardians.

24. In Parishes and Townships not comprised in a Union or under a separate Board of Guardians, the Clerk, Governor, or the Overseers, as the case may be, shall, so far as they can according to the extent and circumstances of their Parish or Township, carry the foregoing Regulations into execution.

Interpretation clause.

25. The word "Union," as used herein, shall be taken to include not only a Union of Parishes formed under the provisions of an Act passed in the fifth year of the reign of His late Majesty King William the Fourth, entitled "An Act for the Amendment and better Administration of the Laws relating to "the Poor in England and Wales," but also any union of Parishes incorporated or united for the relief or maintenance of the poor under any Local Act of Parliament.

And the word "Guardians," as used herein, shall be taken to include not only Guardians appointed or entitled to act under the provisions of the said last-mentioned Act, but also any Governors, Directors, Managers, or Acting Guardians entitled to act in the ordering of relief to the poor from the Poor Rates under any Local Act of Parliament.

[DIRECTIONS and REGULATIONS of like effect were issued (*b.*) for Places within the Metropolis.—ED.]

(*c.*) AMENDED REGULATIONS of August 25th as to SHIPPING.

Amended Regulations as to Shipping.

1. In this Order—

The term "ship" includes vessel or boat :

The term "master" includes the officer or person for the time being in charge or command of a ship.

The term "cholera" includes choleraic diarrhœa :

The term "Nuisance Authority" has the same meaning as in "The Sanitary Act, 1866 :"

2. The Master of every ship within the district of a Nuisance Authority, having on board any person affected with cholera, or the body of any person dead of cholera, or anything infected with or that has been exposed to the infection of cholera, shall, as long as the ship is within such district, moor, anchor, or place her in such position as from time to time the Nuisance Authority directs.

3. If at any time a Nuisance Authority is informed that cholera exists, or within three days previously has existed, in a ship within its district, such authority shall cause the ship to be forthwith visited, inspected, and otherwise dealt with (according to the circumstances of the case), in like manner as nearly as may be as if the ship were a house within the district of such authority, and shall give all such medical and other directions with reference to the persons therein, as seems to such authority requisite or proper for preventing the spread of the disease therefrom, and for disinfection or disposal of any thing infected, or that has been exposed to infection therein or therefrom.

[Here follows (*d.*) MEMORANDUM on the PRECAUTIONS to be taken against CHOLERA, under the REGULATIONS recently issued by the LORDS of the COUNCIL, which it is not necessary to reprint, as it is to be found in an amended form in No. I., New Series Local Government Board Reports.—ED.]

(*e.*) GENERAL MEMORANDUM ON THE PROCEEDINGS WHICH ARE ADVISABLE IN PLACES ATTACKED OR THREATENED BY EPIDEMIC DISEASE.

Proceedings advisable against Epidemic Diseases.

1. Wherever there is prevalence or threatening of cholera, diphtheria, typhus, or any other epidemic disease, it is of more than common importance that the powers conferred by the Nuisances Removal Acts, and by various other laws for the protection of the public health, be well exercised by those in whom they are vested.

2. If the danger be considerable, it will be expedient that local authorities, in taking measures against it, avail themselves of the best medical advice which their district or its neighbourhood can supply.

3. Proper precautions are equally proper for all classes of society. But it is chiefly with regard to the poorer population, therefore chiefly in the courts and

Proceedings advisable against Epidemic Diseases.

alleys of towns, and at the labourers' cottages of country districts, that local authorities are called upon to exercise vigilance, and to proffer information and advice. Common lodging-houses, and houses which are sub-let in several small holdings, always require particular attention.

4. Wherever there is accumulation, stink, or soakage of house-refuse, or of other decaying animal or vegetable matter, the nuisance should as promptly as possible be abated, and precaution should be taken not to let it recur. Especially all complaints which refer to sewers and drains, or to foul ditches, and ponding of drainage, or to neglect of scavenging, should receive immediate attention. The trapping of house-drains and sinks, and the state of cesspools and middens, should be carefully seen to. In slaughter-houses, and other places where beasts are kept, strict cleanliness should be enforced.

5. In order to guard against the harm which sometimes arises from disturbing heaps of offensive matter, it is often necessary to combine the use of chemical disinfectants with such means as are taken for the removal of filth; and in cases where removal is for the time impossible or inexpedient, the filth should always be disinfected. Disinfection is likewise desirable for unpaved earth close to dwellings, if it be sodden with slops and filth. Generally, where cholera or typhoid fever is in a house, the privy requires to be disinfected.

6. Sources of water-supply should be well examined. Those which are in any way tainted by animal or vegetable refuse, above all, those into which there is any leakage or filtration from sewers, drains, cesspools, or foul ditches, ought no longer to be drunk from. Especially where the disease is cholera, diarrhœa, or typhoid fever, it is essential that no foul water be drunk.

If unfortunately the only water which for a time can be got should be open to suspicion of dangerous organic impurity, it ought at least to be boiled before it is used for drinking, but then not to be drunk later than twenty-four hours after it has been boiled. Or, under medical or other skilled direction, water, in quantities sufficient for one day's drinking in the house, may be disinfected by a very careful use of Condy's red disinfectant fluid, which should be added to the water (with stirring or shaking) in such number of drops that the water, an hour afterwards, shall have the faintest pink colour which the eye can distinctly perceive. Filtering of the ordinary kind cannot by itself be trusted to purify water, but is a good addition to either of the above processes. It cannot be too distinctly understood that dangerous qualities of water are not obviated by the addition of wine or spirits.

7. The washing and lime-whiting of uncleanly premises, especially of such as are densely occupied, should be pressed with all practicable dispatch.

8. Overcrowding should be prevented. Especially where disease has begun, the sick-room should, as far as possible, be free from persons who are not of use or comfort to the patient.

9. Ample ventilation should be enforced. It should be seen that window-frames are made to open, and that windows are sufficiently opened. Especially where any kind of infective fever has begun, it is essential, both for patients and for persons who are about them, that the sick-room and the sick-house be constantly well traversed by streams of fresh air.

10. The cleanliest domestic habits should be enjoined. Refuse-matters which have to be cast away should never be let linger within doors, and things which have to be disinfected or cleansed should always be disinfected or cleansed without delay.

11. Special precautions of cleanliness and disinfection are necessary with regard to infective matters discharged from the bodies of the sick. Among

Proceedings advisable against Epidemic Diseases.

discharges which it is proper to treat as infective, are those which come, in cases of small-pox, from the affected skin ; in cases of cholera and typhoid fever, from the intestinal canal ; in cases of diphtheria, from the nose and throat ; likewise, in cases of any eruptive or other epidemic fever, the general exhalations of the sick. The caution which is necessary with regard to such matters must, of course, extend to whatever is imbued with them ; so that bedding, clothing, towels, and other articles, which have been in use by the sick, do not become sources of mischief, either in the house to which they belong, or in houses to which they are conveyed. Moreover, in typhoid fever and cholera, the evacuation should be regarded as capable of communicating an infectious quality to any night-soil with which they are mingled in privies, drains, or cesspools; and this danger is best guarded against by thoroughly disinfecting them before they are thrown away : above all, they must never be cast where they can run or soak into sources of drinking water.

12. All reasonable care should be taken not to spread infective disease by the unnecessary association of sick with healthy persons. This care is requisite, not only with regard to the sick-house, but likewise with regard to day-schools and other establishments wherein members of many different households are accustomed to meet.

13. Where dangerous conditions of residence cannot be promptly remedied, it will be best that the inmates, while unattacked by disease, remove to some safer lodging. If disease begins in houses where the sick person cannot be rightly circumstanced and tended, medical advice should be taken as to the propriety of removing him to an infirmary or hospital. In extreme cases, special infirmaries may become necessary for the sick, or special houses of refuge for the endangered.

14. Privation, as predisposing to disease, may require special measures of relief.

15. In certain cases, special medical arrangements are necessary. For instance, as cholera in this country almost always begins somewhat gradually in the comparatively tractable form of what is called "premonitory diarrhœa," it is essential that, where cholera is epidemic, arrangements should be made for affording medical relief without delay to persons attacked, even slightly, with looseness of bowels. So again, where small-pox is the prevailing disease, it is essential that all unvaccinated persons (unless they previously have had small-pox) should very promptly be vaccinated; and re-vaccination should also be offered, both to persons above puberty who have not been vaccinated since childhood, and to younger persons whose marks of vaccination are unsatisfactory.

16. It is always to be desired that the people should, as far as possible, know what real precautions they can take against the disease which threatens them, what vigilance is needful with regard to its early symptoms, and what (if any) special arrangements have been made for giving medical assistance within the district. Especially in case of small-pox or of cholera, such information ought to be spread abroad by printed hand-bills or placards. In any case where danger is great, house-to-house visitation by discreet and competent persons may be of the utmost service, both in quieting unreasonable alarm, and in leading or assisting the less educated and the destitute parts of the population to do what is needful for safety.

17. The present memorandum relates to occasions of emergency. Therefore the measures suggested in it are all of an extemporaneous kind; and permanent provisions for securing the public health have not been in express terms insisted

on. It is to be remembered, however, that in proportion as a district is habitually well cared for by its Sanitary Authorities, the more formidable emergencies of epidemic disease are not likely to arise in it.

18. For detailed advice on Disinfection, see the Office Memorandum on that subject.

JOHN SIMON.

(*f.*) MEMORANDUM ON DISINFECTION.

Memorandum on Disinfection.

N.B.—*It is to cleanliness, ventilation, and drainage, and the use of perfectly pure drinking water, that populations ought mainly to look for safety against nuisance and infection. Artificial disinfectants cannot properly supply the place of those essentials, for, except in a small and peculiar class of cases, they are of temporary or imperfect usefulness. That no house-refuse, not only no excremental matter but also no other kind of dirt or refuse, should remain on or about inhabited premises, is a first rule against infection. That the air within the house should never in any part of the house be stagnant, but should always be in course of renewal from without by uninterrupted and abundant supplies of fresh air, is a condition of equal importance. And that all water meant to be used for drinking or cooking should be drawn from sources which cannot have been polluted by any kind of refuse-matter, is a third most important rule for the avoidance of infection.*

If dwelling-places have within them any odour of drainage, particular examination should be made (1) *whether the filth which house-drains are meant to carry away is retained in or near the premises in ill-made drains, or sewers, or cesspools, or perhaps is leaking from house-drains within the house;* and (2) *whether, inside the house, the inlets of drains and sinks are properly trapped; and* (3) *whether the drains and sewers are sufficiently ventilated outside the house. All waterclosets within houses should have free openings for ventilation from and into the outer air. Of a cesspool, the only true disinfection is to abolish it. In country places, where proper drainage is not provided, the nuisance of open privies may be best avoided by the use of the so-called earth-closet.*

If a sewer is much complained of, as stinking into the public way, generally the presumption is, that, from original ill-construction or some other cause, it does not properly fulfil its object, but has filth accumulated and stagnant in it; and such a sewer, besides occasioning nuisance in the public way, may be the source of serious danger to the inhabitants of houses which drain into it. It is most important that all sewers should be well ventilated at points where their effluvia will be least injurious; and ordinary drain-pipes may be used to conduct the effluvia to a distance.

For convenience, in this memorandum, the word "disinfectants" is used to cover, not only those true disinfectants which permanently destroy infective matter, but also those agents which merely arrest the process, or absorb the offensive products, of organic decomposition.

For artificial disinfection on a large scale, *the agents which most commonly prove useful* are—quick-lime, chloride of lime, carbolic acid, sulphate of iron, perchloride of iron, and chloride of manganese. The following are also efficient disinfectants, but, as being dearer, are less suited, for large operations: sulphate of zinc, chloride of zinc, chloride of soda, and permanganate of potash. In certain cases chlorine gas, or nitrous acid gas, or sulphurous acid gas, may advantageously be used; and, in certain other cases, powdered charcoal or fresh dry earth.

Quick-lime ought to have been recently burnt, and may be used either in the form of dry powder, or stirred up with about ten times its bulk of water as milk of lime. *Chloride of lime* is best used with water, and thoroughly mixed with it, in the proportion of a pound to the gallon; or, of the solution, as commonly sold, about two pints may be mixed with a gallon of water. *Carbolic acid* (in the fluid form in which it is commonly sold) should be dissolved in about eighty times its volume of water, with which it must be mixed by strong shaking in a closed vessel. *Sulphate of iron* should be dissolved in ten times its weight of water; a solution which is best effected by employing hot water and stirring. Of *perchloride of iron* and *chloride of manganese*, the common concentrated solutions may be used, diluted with ten or twelve times their bulk of water. *Sulphate of zinc* should be dissolved in about ten times its weight of warm water. Of *chlorine of zinc*, the common concentrated solution may be diluted with eight or ten times its bulk of water.* Of *chloride of soda*, the common solution may be used like that of chloride of lime. Of *permanganate of potash*, an ounce may be dissolved in a gallon of water.†

All disinfectants must be used in *quantities proportionate* to the amount of matter or surface to be disinfected. When the matters requiring to be disinfected have an offensive smell, the disinfectant should be used till this smell has entirely ceased, and as often as the smell recurs, the disinfectant must again be used.

1. During the *emptying of privies and cesspools*, and whenever else temporary disinfection is required for them, carbolic acid, or sulphate of iron, or perchloride of iron, or chloride of manganese, or chloride of zinc, will be found available. A dilute solution (as above) of one of those agents should be poured into the privy or cesspool, from a quart to a pailful at a time, till the desired effect is obtained. Especially where cholera or typhoid fever is present, privies and cesspools ought to be very frequently flooded in this manner. The best test of their being adequately disinfected is the entire absence of fæcal or ammoniacal odour.

2. *Heaps of manure or other filth*, if it be for the time impracticable or inexpedient to remove them, should be covered, to the depth of two or three inches, with a layer of freshly burnt vegetable charcoal in powder. Freshly burnt lime may be used in the same way, but is less effective than charcoal. If neither charcoal nor lime be at hand, the filth should be covered with a layer, some inches thick, of clean dry earth. For a *privy which has only solid contents*, the same sort of treatment is applicable. *Earth near dwellings*, if it has become offensive or foul by the soakage of decaying animal or vegetable matter, should be treated on the same plan.

3. If *running sewage*, about to be used in agriculture, require to be disinfected, the chloride of manganese or perchloride of iron may be best used;‡ but if the sewage is to pass into a river, or into any pond or canal, where it might again become offensive, chloride of lime is to be preferred; and in this case a pound of good chloride of lime will generally suffice to disinfect 1,000 gallons of the sewage.

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* Or the preparations respectively known as Burnett's and Crewe's disinfectant solutions may be employed.—J.S.

† Or Condy's disinfectant fluids, which contain manganic and permanganic salts, may be used.—J.S.

‡ In some such cases McDougall's process, as practised by him at Carlisle, may be applicable; and his powder may also be applicable to cases mentioned in § 1.—J.S.

Memorandum on Disinfection.

For foul ditches and other stagnant drainage, chloride of lime is also the proper disinfectant.

4. Where it is desirable to disinfect, before throwing away, the *evacuations from the bowels of persons suffering from cholera or typhoid fever*, some of the disinfectant (which here may best be chloride of lime) should be put into the bed-pan or other vessel before it is used by the patient, and some more should be added immediately after. Its thorough mixture with the evacuation should be ensured. Care should also be taken that portions of the discharges do not remain about the patient's body or in his dress.

5. *Linen and Washing Apparel* requiring to be disinfected may be set to soak in water containing per gallon about an ounce either of the common clear solution of chloride of lime or of that of chloride of soda. Or the articles in question may be plunged into boiling water, and afterwards, when at wash, be actually boiled in the washing water.

6. *Woollens, Bedding, or Clothing* which cannot be washed, may be disinfected by exposure for two or more hours, in chambers constructed for the purpose, to a temperature of F. 210°-250°. When this cannot be done, the natural disinfecting process of prolonged exposure to air, sun, and rain, ought to be had recourse to.

7. For the disinfection of the *interior of houses*, the ceilings and walls should be washed with warm quick-lime water. The woodwork should be cleansed with soap and water, and subsequently washed with water containing in each gallon about two ounces of the clear solution of either chloride of lime or chloride of soda.

8. *A room no longer occupied* may be disinfected by chlorine gas, or nitrous acid gas, or sulphurous acid gas. And for this purpose the gases may be produced in the room as follows: —*chlorine gas*, by pouring over a quarter of a pound of finely powdered black oxide of manganese, contained in a jar, half a pint of muriatic acid previously mixed with a quarter of a pint of water; or by pouring over a quarter of a pound of chloride of lime, contained in a jar, a quarter of a pint of muriatic or dilute sulphuric acid;—*nitrous acid gas*, by pouring over an ounce of copper shavings or turnings, contained in a deep jar, three ounces of concentrated nitric acid;—*sulphurous acid gas*, by burning an ounce or two of flowers of sulphur in a pipkin. The process of disinfecting a room by any of these gases requires several hours; and while it is going on, all doors, chimneys, and windows of the room must be kept carefully closed. Precautions to this effect should have been taken before the chemicals are mixed, as the person who starts the process (having to avoid the gases) must not afterwards loiter in the room. When the process is at an end, doors and windows should be fully opened.

9. *Ships* (except the class of cattle-ships for which special treatment is required) may be disinfected on the same plan as houses. The process should be conducted as distantly as may be from the shore and from other vessels. All the compartments of the ship should first be fumigated with some disinfectant gas, best with chlorine or nitrous acid, and then all the accessible woodwork (in and out) should be washed with a solution of chloride of soda or lime. The bilges require particular attention, and before they are first pumped some pounds of chloride of lime in water, or some gallons of solution of perchloride of iron, should be poured into them, for the purpose of disinfecting the bilge-water. All permanent shingle and small-grained ballast should be replaced by fresh.

It is most frequently with reference to the infection of yellow fever that ships require to be disinfected, and generally in such cases the cargo requires the same

Memorandum on Disinfection.

treatment as the ship. So far, therefore, as the cargo has not been completely disinfected in the course of the disinfection of the ship, and so far as is practicable, it ought, before it is landed, and part by part as it is removed, to be disinfected by free sprinklings with the solution of chloride of lime or soda. Also in these cases it is to be remembered that persons from on board the infected ship (especially those who have been most in its hold) may carry infection about their persons—in precaution against which danger it is desirable that the persons should have complete baths of soap and water and that their clothes should partake of the general fumigation of the ship. The person who conducts the fumigation of a ship (especially where there is question of yellow fever) ought not at first to enter the hold, but merely to hang down the hatches, or otherwise place within the hold, the vessel which contains his chemical mixture.

John Simon.

[Earlier editions of the two last memoranda (*e*) and (*f*) had been given six years previously in Report III.—Ed.]

PATHOLOGICAL NOTES.

RELATION OF CHOLERA TO LOCAL DIFFERENCES OF SOIL.

Notes on Mr. Radcliffe's Observations.

Relation of cholera to local differences of soil.

Subsequently to the making of his report, and while it was in course of being printed, Mr. Radcliffe, at my request, made a special inquiry as to the soil on which the workhouse is built, and informed me as follows :—" A glance at " the geological map will show that the buildings are partly situated upon the " edge of a field of brick-earth, partly on gravel. The infirmary indeed is placed " entirely beyond the edge of the brick-earth and upon gravel. But I learn " from the architect, Mr. Richard Tress, that the foundations of the entire " building, with the exception of the imbecile ward, are sunk into a clean, " small, yellow gravel with little sand. The imbecile ward was built upon the " site of an old and tolerably deep pond. Mr. Tress is unable to speak precisely " of the nature of the subsoil at this spot, but he intimates that the bottom of the " pond was clay, the superficial beds having been cleared away. There is " probably much 'made-earth' beneath the building, formed in filling up the " pond beneath the imbecile ward."

Mr. Radcliffe also at my request, and with the assistance of Mr. Wm. Whitaker, of the Geological Survey of England, made a special investigation of the soil upon which the School is built, and informed me as follows :—" The " investigation brought to light the hitherto unsuspected fact that the school " and premises stand upon a thick bed of fine brick-earth, and not upon " gravel, as previously supposed. A boring in the boys' playground, a little " in the rear of the main building, gave 5 feet of made soil and $11\frac{1}{2}$ feet

" of brick-earth, the latter not being bottomed. The streets immediately " surrounding the school, so far as could be ascertained, stand upon made earth " and gravel."* The interest of this fact, in relation to Professor Pettenkofer's doctrine of the influence of soil in limiting epidemics of cholera, cannot be overlooked.—J.S., May 31st.

EAST LONDON EPIDEMIC OF CHOLERA.

Note on Mr. Radcliffe's Report.

East London epidemic of cholera.

It is in many ways a question of vast public importance, whether last year's terrible outbreak of cholera in the eastern districts of London was produced by the distribution of infected water from certain reservoirs of the East London Water Company. Mr. Radcliffe's very elaborate and impartial inquiry has led him to the conclusion that it was so: and the *form* of his conclusion (a form which may have to be distinguished from the *substance*) is, that the water of the reservoirs, considered as drinking-water, had in it a power of direct infectiveness for those who drank it.

After giving my most careful judgment to the case, I feel bound to say that the facts adduced by him seem to me, as a whole, almost irresistibly to force the substance of his conclusion on the mind; but some of the exceptional cases to which he adverts in pages 312–325 of his report are apparently strong facts to the contrary. And having regard to the extreme gravity of the charge which is made against the water company, I feel it right distinctly to admit that I do not at present see my way to explain the apparent contradictions. It may be that the real explanation lies, even for all these cases, in conditions like those to which Mr. Radcliffe adverts in the important statement (printed in italics) at pages 324–5; in which event of course they would not in any degree contradict Mr. Radcliffe's general conclusion: but I confess I do not see how that sort of explanation is likely to cover the very striking immunity of the Limehouse school.

I need hardly say that I have with much care considered the whole matter of the East London epidemic in the light of Professor v. Pettenkofer's doctrine as to the laws of cholera epidemics. And the study of the matter in that point of view does, no doubt, show some facts which Pettenkofer would deem extremely significant. In the first place, in searching for conditions which might explain the special severity of cholera in those eastern districts of London, we come on the fact that, up to the end of 1865, in the affected territory, as far eastward as the river Lea, the construction of the main low-level sewer of the metropolitan drainage had, for a year or two, been constantly in progress with such more or less pumping of water from the sub-soil as had been necessary for the protection of the works; and that afterwards, for the six months immediately before the outbreak, the Isle of Dogs branch of this sewer (shown in Mr. Radcliffe's map as a red line running from Blackwall to Bromley) had been in progress, and had been *attended with a continuous,* but not very large, *removal of water from the*

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* I have to thank the Limehouse Board of Guardians for the readiness with which they granted me permission to make this investigation of the soil, and Mr. Swepstone, the clerk to the guardians, and Mr. Dunch, the architect and surveyor to the Board of Works, for their great kindness in facilitating the investigation.—J.S.

East London epidemic of cholera.

*gravel sub-soil.** Now, in Pettenkofer's doctrine, the moment when ground-water is sinking in porous soil is the moment when a district is most disposed to choleraic infection; and it will be evident that the pumping which was and had been in progress in the parts referred to must have tended (I cannot say how much, nor over how wide an area) to bring the ground there, in the summer of 1866, into that "zeitliche Predisposition" for cholera. This fact, however, loses much of its significance when it is noticed that in the districts east of the Lea, where cholera began with even greater severity than in the last-mentioned districts, no such influence had been in operation:—indeed, I am assured by Mr. Rawlinson (whose evidence I must deem quite conclusive) that, for the last six or seven years, the permanent pumping arrangements connected with the sewerage east of the Lea have, to his knowledge, been such that no considerable oscillations in the water-level of the sub-soil have been possible. The second fact which I have to mention belongs to the exceptional case of the Limehouse school, and seems to illustrate Pettenkofer's doctrine of local immunities. For, in searching for the conditions of the immunity of that school amid the general sufferings of its district, the only exceptional condition we could find is one of a geological sort: *the school stands as it were on an island of brick-earth, while all the immediately surrounding district is of gravel.*† There was another very

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* The following table, for which I am indebted to Mr. Cooper, of the Metropolitan Board of Works, gives the best means I can procure for estimating the quantity of water removed in this part of the undertaking:—J.S.

CONSTRUCTION of SEWERS, Isle of Dogs Branch of Low-Level Sewer, between Main Low-Level at Bromley Railway Station and East India Dock Road.

Situation of pumping station.	Dates when at work.	Number of Men pumping.	Probable effect.
		(4-in. pumps.)	
No. 1 Shaft on private ground near St. Leonards Road and Railway Station.	From Feby. 5th to May 26th, 1866.	2 men night and day.	Drawing clear and apparently good water from the gravel.
No. 2 Shaft St. Leonards Road.	Feby. 12th to May 19th.	2 men night and day.	Do.
No. 3 do. do. -	Feby. 19th to May 26th.	2 men night and day.	Do.
No. 4 do. do. -	Feby. 26th to July 7th.	2 men night and day.	Do.
No. 5 do. Brunswick Road.	April 2d to July 21st.	2 men night and day.	Do.
No. 6 do. do. -	April 2d to July 28th.	2 men night and day.	Do.
No. 7 do. do. -	April 21st to Aug. 4th.	2 men night and day.	Do.
No. 8 do. do. -	April 23d to July 7th.	2 men night and day.	Do.
No. 9 do. Robin Hood Lane East India Dock Road.	June 18th to Sept. 1st.	2 men night and day.	Do.

† It will be noticed in the geological cholera-map that the other parts of the district marked as brick-earth have a fair allotment of cholera-dots on them; but Mr. Radcliffe is informed that in those parts the brick-earth has been very extensively removed to give material for successive buildings, and the exact effect of these removals, in relation to our present subject-matter, could not be ascertained without innumerable (practically impossible) house-to-house examinations of the ground.—J.S.

East London epidemic of cholera.

interesting case, that of the City of London workhouse, where the "caprice" to be explained consisted in the choleraic affection of a small part of an otherwise unaffected large establishment; and our geological map (which represents the workhouse in question as standing on two different soils) suggested that in this curious little epidemic the parts of the building had been visited or not visited by cholera accordingly as they stood on the one soil or the other; but it will have been seen in Mr. Radcliffe's report that the architect of the building, in answer to our very minute inquiries as to the local differences of the soil, gave us to understand that of the represented brick-earth none had been left beneath the building, and that nearly all the building (unaffected equally with affected parts) had its foundations on gravel. It is possible that some other apparently exceptional facts in the East London epidemic may be more or less plausibly explained from Pettenkofer's point of view:—in regard of Stamford Hill, for instance, the comparatively high-level may be said to count for something; and in regard of North Woolwich it can be urged that so very low a district, in immediate proximity to the river, may easily have had something exceptional in the state of its ground-water and soil;* but there is too little detailed information on these and similar parts of the case for me to venture on any judgment concerning them.

On the whole, I fear it must for the present remain doubtful whether the influences to which Pettenkofer assigns so much importance were really potent in the East London epidemic, either as predestining its general severity, or as permitting exceptional facts within its area. But I may observe that the acceptance of that belief would not imply an acquittal of the East London Water Company as regards the causation of the epidemic. For in his doctrine the predispositions of time and place count for nothing till the exciting cause of the epidemic comes to bear on them; and high level or low level, brick earth or gravel, rising ground-water or falling ground-water, would all have been matters of indifference to the East London population unless the specific germs of cholera-contagium had been scattered broadcast in the territory. How this terrible scattering of the germs of the disease took place is the question which Mr. Radcliffe's inquiry aimed at answering; and his answer in substance is that the East London Water Company did the mischief.

I have said that it may be necessary to distinguish between the substance and the form of Mr. Radcliffe's conclusion. In proportion as Pettenkofer's views may prove right, doubts will occur whether the morbific power of the Old Ford water in those eastern districts (granting it to have been in fault) must have depended on the water's being drunk. It may be urged that, if the drinking of that water was the essential condition of the outbreak, it is difficult to conceive how cholera should not have been carried indiscriminately wherever the water was drunk, difficult to conceive how differences of soil or altitude could vary the infectiveness of the water within the same continuous area of potation. But, for the substance of Mr. Radcliffe's conclusion, is it necessary to assume that the water was drunk? So far as a cholera patient coming into a district can infect the population in other ways than through their drinking-water, must it not equally be the case that a water, infected with cholera-contagium, universally distributed and splashed about and wetting and soaking within a predisposed

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* In two opposite points of view the fact claims to be noted, as possibly interesting, that North Woolwich, having no sewers, could not participate in any influence (good or bad) which the sewerage-system east of the Lea may be deemed to have exerted on the eastern moiety of the outbreak.—J.S.

East London epidemic of cholera.

district, is dangerous independently of its being drunk? Or is it possible that under some conditions a water may be able to infect a soil, and mediately a population, with cholera, and yet not necessarily at the same time be an immediate cause of cholera to those who drink it? Our knowledge of the cholera-contagium, and of its modes of operation on the human body, is far too imperfect for me to pretend to answer these questions with all the qualifications which would be necessary to make the answer applicable to the present discussion. The importance, however, of the distinction which I have drawn will, I think, be evident. For if Mr. Radcliffe's conclusion is to be sustained exactly in the form in which he has drawn it (*i.e.*, virtually considering "distribution" and "drinking" to be equivalent terms in the argument) then perhaps he may be fairly challenged to show, as a rule with no considerable true exceptions, that the Old Ford water-supply carried cholera wherever it was drunk; and an exception really determined by difference of soil would seem almost hopelessly unintelligible. But if the particular form of the conclusion be set aside, and the conclusion simply affirm that the distribution of the Old Ford water caused the East London outbreak of cholera, then, to whatever extent that distribution operated on and through the soil of the territory, so far Pettenkofer's doctrine may admit of more or less plausible application to explain the partialities of the outbreak.

HOURS OF DEATH IN CHOLERA.

Note on Dr. Sutton's Report.

Hours of death in cholera.

The average distribution of Dr. Sutton's 118 deaths through 24 hours of day and night would give a rate of about 5 deaths for each hour. From this average rate the most important deviation seemed to be in the four morning hours, 7–11, when the rate was 7½ per hour. An excess of less marked degree appeared also in the four corresponding evening hours, when the rate was 6¼, and in the last two of those hours, 8. Of course Dr. Sutton's numbers are too few, greatly too few, to justify any general conclusions; and it may therefore be convenient to refer to the facts on this question which were collected at Leipzig in the late epidemic. Dr. Schmieder, in his lately published statistics of that visitation, gives the hours of death of 1,278 cases; and it is noticeable that his hours of least mortality were just those forenoon hours when the Whitechapel deaths were most numerous. In Leipzig the number of deaths per hour, if the total had been uniformly distributed, would have been 53¼; but in fact the hourly distribution of deaths in the four successive quarters of the day, counting from midnight, averaged about as follows: during the first quarter, 51; during the second quarter (which on the Whitechapel analogy ought to have been highest) 46; during the third quarter, 60; during the fourth quarter, 56. Evidently nothing as to the natural history of cholera can be inferred from facts of this sort, unless they be accumulated in very large numbers; nor, unless also the reader be tolerably acquainted with the *horaria* (as to nursing, &c.) of the hospitals whence the facts have been reported. In any future registration of such facts it would be desirable to make separate enumeration of deaths in collapse, as distinguished from deaths in reaction and fever. Of course, too, in discussing the subject of hour of death, regard must be had to the hour of so-called "attack," *i.e.*, the hour of manifestation of severe symptoms. And if this should seem to be governed, at least locally, by some general law, the determining influence of local modes of life would need consideration.

THEORY OF CHOLERA COLLAPSE.

Note on Dr. Sutton's Report.

Theory of cholera collapse.

To the parts of Dr. Sutton's report which are on the theory of collapse, I append a few remarks of my own on the same subject.

Dr. Parkes, in his *Researches into the Pathology and Treatment of the Asiatic or Algide Cholera*, published in 1847, speaks of the collapse of cholera as a "variety of suffocation:" contending with great force, and from a considerable basis of facts, clinical and necroscopical, that the essence of the state of collapse is "a failure more or less complete in the transmission of the blood "through the lungs." In order to account for that non-transmission he argues thus: "As the mechanical part of respiration is perfect, and as there is no "impairment in the voluntary command of the respiratory muscles, and as "the heart evidently beats in many cases till stopped by the want of blood on "the left side, and by its accumulation on the right side, we are compelled to "look for the cause of such arrest of the circulation in the only remaining "element of respiration, namely, in the blood itself." The blood, he infers, is in a changed physical state which renders it more or less unable to pass along the smaller vessels in the system generally, and in the lungs in particular; and in explanation of this he suggests as not improbable that the "poison" of cholera may effect primary chemical changes in the fibrin of the blood.

Dr. George Johnson's theory of collapse, argued by him in various publications from 1854 to the present time, is in its main features an acceptance of the above; but while Dr. Parkes suggests for the assumed primary blood-poison in cholera, that it acts coagulatively or precipitatively on the blood, Dr. Johnson claims for the assumed poison that it has strongly irritant qualities; and while he follows Dr. Parkes in believing that an impeded pulmonary circulation is the central fact in the phenomenology of collapse, he explains the impediment as a spasmodic contraction of the muscular coats of the minute pulmonary arteries due to the irritativeness of his "poison."

The belief that the proximate cause of cholera is a "poison" first acting in the blood is common to Dr. Parkes and Dr. Johnson, as well as to many other writers; and Dr. Johnson builds on that belief his advocacy of a particular principle of treating cholera—the principle, namely, of "assisting nature," by emetics and purgatives, in what he deems to be her "salutary and curative "efforts" of vomiting and purging: but Dr. Parkes's doctrine of the state of the circulatory system in collapse, and Dr. Johnson's doctrine of the dependence of that state on spasmodic closure of the minute pulmonary arteries, are doctrines which do not necessarily involve an acceptance of the "eliminative treatment" of cholera, nor pre-suppose any belief that cholera begins as a blood-disease. It is important that the different questions should not be jumbled together as one; particularly important now, because the notion of a primary blood-poison in cholera seems tending more and more to be superseded.

1. First, as regards the state of the circulation in collapse. Personally knowing Dr. Parkes's great accuracy of statement, I attach the utmost importance to the descriptions contained in his work. And their details do certainly in great part justify the generalisation which he makes of them.* But

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* Yet it deserves notice that even among Dr. Parkes's own cases of death in collapse the post-mortem evidence of interrupted pulmonary circulation was not universal; and I may add, though without attaching equal importance to the fact, that a citation of miscellaneous authorities on the state of the heart and lungs in death by collapse (such a citation as was

Theory of cholera collapse.

whether the morbid phenomena which he describes are rightly accounted for by the doctrine of artérial obstruction in the lungs (either such as he supposes, or such as Dr. Johnson supposes) is matter of much more doubt: for feebleness of heart-contraction appears to be an invariable fact in choleraic asphyxia; and so far as this affects (or at least predominantly affects) the right side of the heart, so far it tends to produce much such a disturbance of circulation as would result from the supposed arterial obstruction. Present opinion seems, I think, generally to be that, in the main it is the dynamical affection of the heart (not the supposed obstruction of pulmonary arteries) which gives the true explanation of Dr. Parkes's facts; but this would not of necessity imply, either for the pulmonary or for the aortic circulation, that all the arterial resistances are normal. Whatever ætiological view be taken of the connexion of the symptoms of collapse, it cannot be deemed unlikely that a much diminished volume and impaired fluency of the blood, when they have arisen, should excite certain phenomena of their own in the sphere of arterial contractility, as well as have their own physical consequences, nor again that certain changes of arterial tone should go with certain changes of cardiac action. Be this as it may, some of the phenomena presented in the aortic system in collapse are such as arterial contractility would seem very plausibly to explain. Such are some of the inequalities of temperature and circulation in the diseased body, not only as between internal and external parts, but as between different parts (external or internal) in the aortic circulation. Specially, for instance, I cannot conceive from what other basis to explain the tendency to equalization of temperature between external and internal parts which is apt to show itself in the fatal ending of collapse, and even to continue after death, as though a final relaxation of arterial rigidity permitted the blood at last to find way through its normal channels. And if the cold and cyanosed state of external parts in cholera be not to some extent under control of arterial contractilily, I cannot conceive through what mechanism to explain that exceptional state of mammary circulation which permits the continued secretion of milk by nursing women who are in collapse.

2. The belief that a primary "blood-poison" is the proximate cause of cholera, the direct source equally of its intestinal and of its asphyxial manifestations, is, so far as I know, mere hypothesis. It has been much accepted as the only possible explanation of certain supposed, but very questionable, facts in the natural history of the disease; specially in explanation of the supposed fact, that the utmost collapse of cholera may concur with little or no affection of the intestinal canal. It is of supreme pathological importance to be right in the matter of these premisses. Is it, or is it not, true that choleraic asphyxia can

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given in 1833 by Prof. Phœbus in chapters 5 and 6 of his classical *Leichenbefund bei der Orientalischen Cholera*) would show still less uniformity of evidence in that respect. Also, in my opinion, the assertion made by Prof. Griesinger (in § 483 of the admirable essay on cholera which forms part of his *Infections-Krankheiten* in the *Handbuch der Pathologie und Therapie*) deserves much weight: viz.. "that the distention of the right cavities of "the heart appears not to be present during life, as percussion gives (invariably?) a small "area of cardiac dulness." Supposing the general accuracy of Dr. Parkes's descriptions to be conceded, judgment must, I think, be reserved on the meaning of the alleged exceptions. For, whatever question there may be as to the inter-dependence of the symptoms of cholera, it is certain that the disease, in proportion to its flux, tends to reduce more or less rapidly both the volume and the fluency of the blood; and till we know exactly what would be the ultimate anatomical expression of those changed physical states of the blood, taken by themselves, it is impossible to affix a right value to the cases of cholera where post-mortem appearances, or facts observed during life, have not answered to Dr. Parkes's general description of the anatomy of death in collapse.—J.S.

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arise otherwise than in consequence of the bowel-disease? This question has been much perplexed, partly through the vast number of vague assertions which are current on the subject, and partly through an assumption which has often been prematurely, and perhaps wrongly, made, that the significance of the bowel-disease in cholera is to be measured by the quantity of the fluid secretion from the bowel. Properly to discuss the main question, that assumption must be disallowed, and the points be separately considered.

(*a*.) That the large, often enormous, fluid discharges which generally characterise cholera represent corresponding de-aquation and de-salination of blood and textures in the patient's body, and that such changes must at least for a time interfere to some considerable extent with all or most of the chemical processes of the body, cannot, I suppose, be disputed. And on the hypothesis that cholera begins in the bowels, it might seem probable that all, or nearly all, the facts of collapse and secondary fever would admit of being referred, directly or indirectly, to that generally enormous flux. Especially it would seem plausible to refer to the altered blood either a power of mechanical obstruction, or a power of provoking resistent muscular constriction, in the vessels through which it has to pass. At present, however, very strong arguments against any such doctrine of collapse are adduced. Some weighty statements on the subject, having in them every appearance of accuracy, are made, for instance, by Dr. Goldbaum in his recent report (published in Virch. Arch., Feb. 1867) of the experience of the Berlin Cholera Hospital No. III., in the epidemic of 1866; a report which is the more valuable from the fact of the author's having been in part-charge of cholera hospitals in Berlin in the previous epidemics of 1853, 1854, and 1855. Dr. Goldbaum's conclusion, supported by many illustrative cases, is strongly against the doctrine that inspissation of the blood is the cause of the asphyctic state. He (like many previous observers—notably the chief Anglo-Indian authorities, and, in Europe, Magendie, Romberg, Parkes, and others) insists that the relation of flux to asphyxia is rather an inverse than a direct proportion, and that the cases of worst augury are cases which have fallen into collapse after but little or no vomiting and purging. He, moreover, expressly guards against undue importance being attached in such cases to the quantities of fluid (half or two-thirds of a gallon at the utmost) which may be retained within the patient's intestinal canal; pointing out that the contrast is with cases where perhaps as much as seven gallons are discharged by vomiting and purging, and that consequently no allowance made for intestinal contents can affect the truth of his proposition. In this context, too, it seems convenient to refer to the comparison which many experienced observers of both sorts of disease have drawn between the phenomena of cholera-collapse on the one hand, and those of the cold stage of malarious disease on the other. Dr. Goodeve, for instance, in his article on cholera in Reynolds's System of Medicine, arguing that "symptoms similar to "collapse may be produced by poisons without any purging," observes that he has "seen people under the influence of malarious poison in Calcutta lie for "hours as cold and pulseless, and as embarrassed in the breathing, as in "cholera." No doubt both sorts of collapse have very much in common as regards their spheres of manifestation, and much also as regards the phenomena themselves; but of course the likeness between them does not exclude the possibility that they may be induced by very different causes.

(*b*.) As regards the other point, materials for judgment are less definite; but certainly, in the present state of information on the subject, the proposition is by no means established that cholera collapse ever occurs without bowel-disease enough probably to account for it. Abstraction of fluid, I need hardly observe,

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is not the only way by which abdominal lesions can affect the circulation of the blood. There are channels for nervous, as well as for humoral, sympathy; and the heart's action can be lowered to the utmost (whether with consensual changes of arterial tone, I know not) by abdominal lesions in which little or no fluid is expended. Physiologists will remember those admirable researches of Goltz* and Bernstein†, which elucidate the exact course and mechanism of such sympathies; and every practitioner of medicine or surgery can recall instances where he has seen mortal collapse (substantially, so far as I know, not different from the collapse of cholera) produced by the very onset of traumatic and other abdominal inflammations, sometimes of no great apparent magnitude. In comparison with some of such instances, the least amount of bowel-disease which (so far as I know) has ever yet been found in the bodies of persons dead with the cholera-collapse must, I believe, be deemed very considerable. Doubtless there are cases on record where men, stricken with cholera-collapse, are said to have suddenly fallen, even numbers of them together, in the streets or elsewhere in their ordinary pursuits, "tumbling over each other lifeless," or as if "knocked "down dead by lightning," or "as if they had drunk the concentrated poison of the "upas tree." It may well be that some of these pictures are unintentionally overdrawn; representing less the real objective occurrences than they represent that utter dismay, that sense of mysterious death too swift for remedy, which severe epidemics of cholera are singularly apt to produce. But, taking them at what they are worth, what reason is there to believe that the sufferers who were so stricken down had not bowel-seizure as the ground of their collapse? No doubt the opinion has been current that cholera, acting in some mysterious way on the total organism, may "kill and leave no sign:" but in proportion as exact morbid anatomy has been cultivated, that opinion has, I think, more and more seemed to rest on a mythical basis; and the doctrine of primary collapse ought at least, without hesitation, to be rejected for cases where post-mortem examination of the bowels has not been made. In illustration of these remarks, I would refer very particularly to the important case given above at page 392 by Dr. Sutton. It was a typical case of *cholera sicca.* It was a case of cholera-death so swift that probably none of the reported "upas poisonings" were swifter. But fortunately the body was anatomised. The whole length of the small intestine was found containing choleraic effusion; and to assume in the face of that fact that the cholera-collapse was primary, would, in the present state of knowledge, be, to say the least of it, a simple *petitio principii.*

In the present state of knowledge, then, I do not find it proven, nor do I see any theoretical convenience in taking for granted, that cholera begins as an active blood-change capable of producing primary collapse. The facts, so far as I know them, can all be reconciled with the belief that cholera begins as bowel-disease, producible by direct contagion without even a passive intervention of the blood, and that all asphyctic phenomena of the disease are supervenient sympathetic phenomena. That, so far as they are facts of cardiac paralysis and arterial contraction, they may be attributed to nervous sympathy between bowels and circulatory system, without reference to the greater or less humoral effect of the coincident flux from the bowels, is at present a tenable view. At the same time I hesitate to accept as proven that cholera-collapse is independent of humoral sympathy. That it may often be apparently so is, no doubt, well shown by the statements I have quoted from Dr. Goldbaum and others. But it must be remem-

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* Virch. Arch., vol. xxvi.—J.S.

† Reichert and Du Bois Reymond's Archiv, 1864.—J.S.

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bered that in those comparative statements two most important variables are not taken into account. First, there is the varied rapidity of the local morbid process—a very considerable range of difference; and it is imaginable that the power of the intestinal flux to produce collapse may vary with the rapidity, rather than with the mere degree, in which it tends to inspissate the blood. Secondly, there is the varying susceptibility of the individual patient; and that this has range enough to account for very considerable differences of manifestation in the functions concerned in collapse will be evident to anyone who has attentively studied the very kindred subject of febrile rigors. Indeed, the power of both the variables in question may be illustrated from that analogy; for all observers know how essentially the rapidity of the thermal rise is the determining condition for the rigor; and all equally know how one patient suffers rigor to the very verge of death from influences which would not appreciably disturb another one.*

In questioning the fact of a primary blood-poisoning in cholera, I, of course, do not intend to deny that the blood *during* cholera is poisoned. From our earliest knowledge of the disease it has been on record that, when pregnant women have cholera, the intra-uterine offspring almost invariably dies; and more recently, in proportion as the anatomy of the disease has got to be better studied, cases have accumulated, giving detailed evidence in support of an opinion which had from the first been entertained, that the infant in such cases dies of true choleraic infection. Waiving particular reference to earlier cases of this sort (for which see, for instance, Phœbus, 1833, op. cit. § 51†, and Buhl, 1856, in the famous Bavarian report) I may quote some statements made by Dr. Goldbaum in the report to which I have already referred. In the three last epidemics, he says he has carefully anatomized 22 such infants and never failed to find appearances which, collectively, he deems characteristic of cholera. "In the stomach and upper part of "the small intestines always there was a fluid like rice-water, sometimes a thick "mass consisting of exfoliated bowel-epithelium; the heart was always ecchy-"mosed; at the back of the tongue there were swollen papillæ as there are in "greater degree in adult cholera-corpses; and in the kidney the yellowish cortex "contrasted strongly with the more blood-holding medullary substance." A case of the same sort will be found mentioned below at page 465 of Dr. Thudichum's report [A]; and I think there can be no reasonable doubt as to the meaning of any of these cases. It may, I think, be assumed for certain that the death of the fœtus is death by cholera‡, and that the fœtus is infected through its blood. And since its blood is a mere derivative of the mother's blood, the fact seems to be beyond dispute that the mother's blood had cholera-contagium in it. In relation to our main argument, however, the question is virtually unchanged. Is there any reason

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* Doubtless it is in considerations like the above that the meaning is to be sought of an assertion which I find made by Dr. Goldbaum, on the strength of some 300 post-mortem examinations, that the intestinal canal of the dead body does not in different cases show such differences of affection as to explain in any degree the greater or less severity of symptoms during life.—J.S.

† Among the cases given in Phœbus's work is one where the infant was not actually born dead, but died an hour afterwards with all symptoms of the epidemic disease.—J.S.

‡ I have been most anxious, if possible, to bring this assumption to the test of actual proof, by causing infection-experiments to be made with the intestinal contents of such cases; and I have communicated with various persons on the subject. Unfortunately the only fœtus which came within our reach was that referred to in Dr. Thudichum's report Its intestinal contents were given to Dr. Sanderson for the purpose, and were used by him in the intended manner, but with only a negative result. The time of year had unfortunately been reached when, as he has stated, all infection-experiments failed: and therefore no conclusion whatever can be drawn from this one test of the fœtal rice-water The general evidence, however, seems fairly conclusive as to their nature.—J.S.

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to suppose that the cholera-contagium in the mother's blood was not a secondary product of disease—was not let into her circulation from the ferment-seething interior of her bowels? In this point of view the case may be usefully illustrated by another, and closely kindred, fact. Dr. Thudichum [A] has made the important observation, that sometimes in cholera the blood, like the rice-water of the intestinal canal, contains butyric acid. He does not believe that this poisonous product of fermentation is primarily formed in the blood; he believes that it is only to be found there when, after collapse, absorption from the bowels has recommenced, and when evidently the presence of that and other like matters in the blood can be interpreted as a fact of secondary infection from the bowel.

EXPERIMENTS ON CHOLERA-INFECTION.

Note on Dr. Burdon Sanderson's Report.

Experiments on cholera-infection.

In supplement to Dr. Sanderson's report, I have two observations to make.

First, Dr. Goldbaum, in his report on the Berlin Cholera Hospital, No. III. published in Virchow's Archiv, vol. 38, describes certain experiments performed by him, in imitation of Thiersch, on dogs and rabbits, and, as these experiments gave only negative results, concludes "that neither fresh nor decomposing " cholera-evacuations are competent to produce choleraic phenomena in the lower " animals." Also, in No. 44 of the Berlin *Centralblatt für die medicin. Wissenschaften*, a like conclusion is suggested by Drs. Guttmann and Baginsky, on the strength of subcutaneous rice-water injections which they had practised on three rabbits and a dog. And in No. 54 of the *Centralblatt* Dr. Stockvis draws the same conclusion from a total of 43 experiments performed by him in various ways on rabbits, dogs, pigeons, frogs, and [query, how many?] mice. But wholly as regards the first two of these contradictions, and in great part as regards the third, it will be evident that the conclusion drawn is far too large for the premisses. Dr. Sanderson's experiments on dogs also gave no result; but the impotence of the agent as against one sort of animal is no disproof of its virulence against other sorts. The positive results of Thiersch's original experiments on mice, and of the experiments here reported of Drs. Sanderson and Thudichum, would retain their full value in regard of the animals experimented on even if all other animals should prove insusceptible of the influence; and that value, in explanation of the facts of human infection, is, in my opinion, conclusive. It is true that on some mice Dr. Stockvis experimented without result: apparently not on many, for he refers to the animals as unsuited for the purpose, and even intimates that they might have been left out of his account: but then it must be remembered that even the affirmative experimenters with mice did not always get positive results. I may add that Messrs. Legros and Goujon (in Robin's *Journal de l'Anat. et de la Physiol.*, 1866) quote negative results from experiments of theirs, which purported to follow Thiersch "avec une minutieuse exactitude," but which, as having been performed on rats, hardly fulfilled that description of them; for Thiersch even attaches some importance to the fact that his mice were white mice.*

Secondly (and this is of important bearing on alleged discrepancies of experimental evidence) some very interesting questions arise as to the uniformity, or absence of uniformity, of infectant power in the choleraic contagium under varying conditions of *time* and *place*. As Prof. v. Pettenkofer has admirably argued,

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* See a recent paper by him, in vindication of his former experiments, Zeitschr. für Biologie, 1867, p. 138.—J.S.

Experiments on cholera-infection.

and as I briefly showed in my last year's report, the unquestionable fact of the contagiousness of cholera has to be reconciled with two very important qualifications: first, that the disease, notwithstanding all its contagiouness, apparently does not, except in parts of Asia, admit of being naturalized and made habitual among populations, in the style of our ordinary current contagia; next, that, even when cholera is most epidemic in a country, there are spots were its contagium may again and again be introduced, yet again and again without result; and that while in some such spots this kind of immunity has shown itself not uniformly, but only in particular epidemics and in connexion with peculiarities of season, in other spots, and apparently from fixed conditions of soil, the immunity against the pestilence has seemed absolute. These qualifications are of incalculable importance to every truth-seeking student of cholera, and involve, of course, the hidden springs of those "caprices," which the laity deem so mysterious and inexplicable, in the localisations and periodicities of the disease. Why, for instance, was it that, in our East London epidemic, the Limehouse establishment for pauper children, standing in the midst of a gravel district, but on its own little island of brick-earth, escaped quite unharmed by the pestilence? And why was it that in Dr. Sanderson's series of experiments abundant positive results were obtained in September and October, but exclusively negative results in November? The time has not yet come for me to venture to argue the whole story of those qualifications; but provisionally I must repeat my deep sense of the value of Prof. v. Pettenkofer's researches, adverted to in my last report, both as contributing new knowledge, and as suggesting right directions for inquiry. It appears certain that henceforth no local health-officer will be properly up to the standard of his scientific duties, unless he thoroughly knows the distribution and stratification of soils in the district for which he acts, nor unless he also maintains such systematic and exact observation of the height of wells as will enable him always to speak with precision as to the movements of water-level in the soil: for it seems established that these are two great governing influences in relation to the spread of disease.

TEMPERATURE IN CHOLERA.

Note on Dr. Thudichum's Report.

Temperature in cholera.

It is all-important to remember that the thermometric observations recorded in this instructive section of Dr. Thudichum's report are exclusively of *external* temperature. In order to a complete understanding of the thermal phenomena of cholera, observations of this kind required to be supplemented by observations of *internal* temperature. And I therefore refer to some such, which have been elsewhere recorded.

In 40 cases of collapse treated in the London Hospital in the late epidemic temperatures were measured, simultaneously in the rectum or vagina and in the axilla, by Mr. F. M. Mackenzie, assistant resident medical officer of the hospital.* Another important set of double observations, simultaneously external and internal, has been published in Germany (Virch. Arch., Jan. 1867) by Dr. L. Güterbock, who, during the epidemic in Berlin had charge of the Cholera Hospital

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* Mr. Mackenzie's notes of these observations are among the interesting papers to which I have already referred as published in the last (third) volume of the London Hospital Reports. Besides his observations, others, also made in the East London epidemic, are mentioned more or less fully in the same volume: viz., a few made in the London Hospital by Messrs. McCarthy and Dove, and some made in the Wapping Cholera Hospital by Dr. Woodman and Mr. Heckford.—J.S.

Temperature in cholera.

No. II. The hospital, within about 10 weeks, received 820 cases of cholera; and Dr. Güterbock's published tables refer to 45 cases of collapse which terminated fatally without reaction, to 10 cases of collapse which went on without secondary disease to recovery, to 23 cases which had longer or shorter periods of secondary disease, and, finally, to 12 cases specially observed during the process of death and for some hours afterwards. He also gives a summary of numerous observations similarly made, but with exclusive reference to collapse, by Professor v. Gräfe, in the Cholera Hospital No. IV. From all the above very instructive observations, it results, in my opinion, quite conclusively that the choleraic affection of the bowels is a heat-making or "inflammatory" process; on which the development of inflammatory fever, by circulation of blood from the inflamed part, would, as a matter of course, manifestly attend, were it not that circumstances special to the disease (circumstances which in this context may be deemed accidental) suppress or circumscribe the manifestation. In a typical case of collapse the axillary thermometer shows a temperature perhaps little above F. 90°, while a thermometer in the rectum or vagina is marking a temperature high above the normal. With the superficial pulselessness of collapse before one, the suspicion cannot fail to arise that this vast difference of temperature between external and internal parts denotes mainly the failing blood-supply of the former; a state which, in so far as it does not equally affect all parts in the aortic circulation, nor even necessarily all external parts in that circulation, may not improbably be deemed to depend, to some extent, on the muscular contractility of peripheral arteries. The suspicion that the specially cold parts of the body are thus cold by reason of their anæmia, and that the anæmia is not a mere passive result of failing of heart-power, is greatly confirmed, as one observes that the differences of temperature between external and internal parts tends to be abated not only when salutary reaction occurs, but equally when the collapse is tending to a fatal termination, and then even beyond the moment of death. In some such cases, though but in few, the external parts of the body will even assume a febrile temperature. See also preceding note on collapse.

It would be of immense interest, were it possible, to know the temperature of the circulating blood, during collapse, in parts remote from the inflamed intestinal canal; to know it, for instance, as to the blood in the aorta and left side of the heart.* It is certain that the intestinal process is of a kind to excite inflammatory fever, and it is certain that in external parts of the body febrile phenomena are (as a rule) not manifested. Is this only because their blood-supply is cut off? Or is it in any degree the index of a fallen general temperature of the blood? The question cannot at present be fully answered. Two antagonistic influences are at work, and in most cases we cannot tell which of them is predominant. On the one hand there is the calorific power of the local process, of which however a very large proportion is of course wasted in the defluxions; and on the other hand there is the general arrest of chemical processes elsewhere in the body. In some cases it seems certain that the temperature of the blood is reduced, for sometimes, though very rarely, even rectum and vagina are cold; but generally the great difference on which I have commented exists, and then it must be deemed a moot question whether the general temperature of the blood is not febrile.

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* The vagina, in which so many observations have been made, is of course physiologically remote enough; but its anatomical nearness to the rectum always suggests the doubt whether its high choleraic temperature is transmitted from the hot fermenting rice-water of the bowels. It deserves notice in this point of view, that, in Professor v. Gräfe's observations, the vaginal temperatures seemed higher than the rectal, which they could not have been if the vagina had got its heat from the rectum. It is true that probably the two measurements were not simultaneously made: but as against any fallacy in that respect it is recorded that *always* the vaginal temperature was the higher, and the summary of the observations even shows that the coolest vagina was warmer than the average rectum.—J.S.

SUPPOSED CHOLERA-FUNGI OF 1849, 1854, AND 1866.

NOTE ON DR. BUCHANAN'S ABSTRACT OF HALLIER'S RESEARCHES.

Supposed cholera-fungi.

In connexion with the above account of Hallier's researches, the reader may be reminded that for a few weeks in the autumn of 1849 we in England had a good deal of talk of a so-called cholera-fungus. The notion was not then broached here for the first time; for, some eighteen months previously, Dr. Cowdell, of Dorchester, had sought to establish, on theoretical grounds, that cholera must depend on a microscopical fungus, absorbed through the lungs into the blood, and multiplying in the blood and bowels:* Professor Mitchell, too, of Philadelphia, had advanced a similar theory:† but the special impulse to the discussion in 1849 (from the last week of September onward) was given by certain publications of Drs. Brittan and Swayne, of Bristol, in the *Medical Gazette* and *Lancet*. These writers had for some two or three months been acting in relation to cholera as a microscopical committee for the Bristol Medico-Chirurgical Society, and in their examination of choleraic discharges had, independently of one another, observed, often in very large number, certain peculiar forms ("annular bodies," "cholera cells," &c.) which they believed to form a connected series, and to be characteristic and causative of the disease. These forms, they said, were of smaller size in the vomit than in the dejections; and Dr. Brittan, stating that he had found still smaller bodies of the same sort in the atmosphere of cholera districts, put forward a note from Mr. John Quekett, then an eminent microscopist, to the effect that he, having examined Mr. Brittan's specimens, from air, vomit, and dejection, "had no hesitation " in stating that in his judgment they were successive stages of development " of the same body, which he believed to be of a fungoid nature." Dr. Budd of Bristol (*Times*, Sept. 26) added that he had found the same peculiar microscopic objects "which seem to be of the fungus tribe" "in great numbers in " almost every specimen of drinking water which he was enabled to obtain " from cholera-districts:" a statement which appeared particularly important in connexion with the very original and remarkable views then recently put forth by the late Dr. John Snow, in a little paper, which now has historical interest, *On the Mode of Communication of Cholera:* for Dr. Snow was contending that cholera is primarily an affection of the intestinal canal; that it is excited by the accidental swallowing of contagious matter discharged from the bowels of the sick—something which, being swallowed, can increase and multiply within the stomach and bowels; and that the great agent of such infection is drinking-water. Dr. Budd in the above quoted letter, and in a pamphlet which he soon afterwards published to the same effect, brought the various views interestingly together, and recommended, as a most important precaution, the disinfection of the discharges of the sick by receiving them "into some chemical " fluid known to be fatal to the fungus tribe."

Thus far the story reads as if the recent observations of Thomé, Klob and Hallier, had in substance been anticipated in England nearly 20 years ago. On fuller inquiry, however, this does not seem to have been the case; and indeed the greatest doubt must be felt whether the appearances insisted on by the

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* Disquisition on Pestilential Cholera: London, 1848.—J.S.

† On the Cryptogamous Origin of Malarious and Epidemic Fevers; Philadelph. 1849.—J.S.

Supposed cholera-fungi.

Bristol observers of 1849 can in any degree claim kindred with those which are now under discussion. For within a month of the publication of the alleged discovery of 1849, the whole statement of facts was put in a totally different light by a report made on the subject to the College of Physicians, by the late Dr. Baly and Dr. Gull, with valuable assistance from Mr. John Marshall, and also by the testimony of various independent writers. Drs. Baly and Gull ended their report with the following conclusions: "Bodies presenting the "characteristic forms of the so-called cholera-fungi are not to be detected in "the air, and as far as our experiments have gone, not in the drinking water "of infected places. It is established that, under the term 'annular bodies' "and 'cholera cells or fungi,' there have been confounded many objects of "various and totally distinct natures. A large number of these have been "traced to substances taken as food or medicine. The origin of others is still "doubtful, but these are clearly not fungi. All the more remarkable forms "are to be detected in the intestinal evacuations of persons labouring under "diseases totally different in their nature from cholera. Lastly, we draw from "these premisses the general conclusion that the bodies found and described "by Messrs. Brittan and Swayne are not the cause of cholera, and have no "exclusive connexion with that disease, or, in other words, that the whole "theory of the disease which has recently been propounded is erroneous, as "far as it is based on the existence of the bodies in question." Dr. Swayne, it is true, protested against the conclusions of the report, and against other criticisms which had been written on the Bristol observations: *Lancet*, pp. 530–2: but practically no advance had been made on Dr. Cowdell's theory of the year before: for it was certain that the appearances originally described had been of the most heterogeneous variety, and nothing like proof had been offered that even any of the alleged specific forms were fungic. The general verdict of 1849 seems finally to have been accepted by the observers themselves; for, from then to the present time, though cholera has again more than once been epidemic in England, they have not, so far as I know, ever re-opened the discussion.

Hallier (citing the Bristol observations only through the notice of them which is contained in Robin's *Végét. Parasit.* pp. 676–80) supposes that the spore-cysts which he now describes were seen at Bristol in 1849. But after going in detail through the descriptions of that period, I find myself quite unable to identify his spore cysts either with the large "annular bodies" which Drs. Brittan and Swayne described, or with the large "cholera-cells" for which Dr. Swayne alone was responsible: and of no other of the alleged cholera forms of 1849 can there in the present context be question.* I may add that the

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* The large "annular bodies" of the two observers had a "peculiar cupped appearance," an "unmistakable appearance of being surrounded by a thick wall, a sharp irregular frac- "ture, the morsels presenting in some measure the same characteristic annulus as the "parent cell did." Drs. Baly and Gull spoke of these bodies as "discs with thick, elevated "and somewhat irregularly curved margins, the central area flattened and obscurely "granular;" Dr. Griffith afterwards spoke of them as "structureless discs;" they were declared by Mr. Marshall to be soluble, some entirely, some almost entirely, in ether, and to be imitable with finely-divided cheese brought with ether under the microscope; also, whatever may have been their nature, they were affirmed by Drs. Jenner, Baly, and Gull to have been seen by them respectively in the discharges of typhoid fever and dysentery, as well as under various other circumstances. Dr. Swayne's large "cholera-cell" was "more "than twelve times as large" as the spores of uredo caries; had a thick and commonly much laminated wall; was "met with of all sizes and in every stage of development," was "covered somewhat irregularly with blunt projections or buds;" contained "within it a "round granular mass which does not quite fill its interior;" and nitric acid, which "has

Supposed cholera-fungi.

Rev. M. J. Berkeley, who is still, as he was in 1849, the first of our mycological authorities, and to whom in 1849 many specimens of cholera discharge were referred, for mycological criticism, by the Bristol observers and others, has done me the favour of looking for me at Hallier's illustrations, and informs me that the "annular bodies" and "cholera cells" which were brought under his notice in 1849 were quite dissimilar from the spore-cysts which are now brought under discussion, and that the latter are now seen by him for the first time. Mr. Berkeley also draws my attention to the resemblance of Hallier's spore-cysts to some of those which were represented by himself, in the Journal Linn. Soc., 1864, as belonging to the fructification of *chionyphe Carteri.*

A reference which in the present context seems to me to be far more important than any in the literature of 1848-9, and which I am surprised not to see prominently made by the present German observers, is to Boehm's observations of 1838.[*] If the doctrine of a cholera-fungus should hereafter be substantiated it will probably be conceded that Boehm deserves the credit of having first published a thoroughly valid account of phenomena of cryptogamic vegetation in choleraic intestines and discharges, and that Hallier's researches do not better join on to the recent essays of Thomé and Klob, than they might have joined in 1838 on to those of Boehm. The fifth section of his admirable little book is entitled *Ueber das Vorkommen der Gährungskeime (Pilze) im Nahrungs-kanal der Cholera-kranken.* In it he describes, as almost constant, that the whole extent of the intestine (but generally the large intestine least) teems with a vegetation of microfungi: that innumerable round and oval, or more elongated, corpuscles are to be found in all the vomit and dejections, as well as in the canal; sometimes single, sometimes two, three, four or more, joined end to end, as links of a chain; and these chainlets sometimes branching; that such forms are held together in mucous floccules, and come best to light when liquor potassæ is used; that within the small intestine they are often so numerous that not the smallest specimen will fail to show numbers of roundish fungic forms amid the débris of epithelium. He appends an illustration which shows quite unquestionably the forms of cryptogamic growth, and refers, for similar forms, to Schwann's then recently published investigations of yeast.

From 1838 till 1866 cryptogamic forms like these seem almost never to have been particularly observed. It is doubtful whether in 1849 they formed an undistinguished part of the miscellaneous phenomena at Bristol: but Mr. Marshall[†] and Mr. Berkeley[‡] seem, without attaching the least importance to the fact, sometimes to have seen them. A passing allusion to such forms, as

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" no action on the uredo beyond rendering it rather paler, slowly dissolves the cholera-cell, " first turning it a bright yellow colour, then resolving its granular contents into three or " four oily-looking globules, and finally reducing its wall to a very thin pellicle with scarcely " a trace of buds." Probably the latter bodies may best be identified for purposes of mycological comparison by reference to the description of them which was given, in that point of view, by the Rev. M. J. Berkeley, in the *Medical Gazette* of Dec. 14, 1849; but it seems conclusive to observe that Mr. Berkeley did not identify the "cholera-cells" as forms of cryptogamic vegetation, which assuredly he would have done if they had been such spore-cysts as Hallier represents. Any one who may wish to compare for himself the representations of 1849 with those now put forth by Hallier, will probably find that, for that purpose, some plates which were published in the London Journal of Medicine, 1849, from etchings by Dr. Swayne, are better (as being more finely executed) than the woodcuts of the weekly journals of the time.—J.S.

[*] Die kranke Schleimhaut in der asiatischen Cholera: Berlin, 1838.—J.S.

[†] *See* Report of Drs. Baly and Gull, p. 18, and Mr. Marshall's letter appended to it, particularly at page 27.—J.S.

[‡] In paper, above referred to, in Med. Gaz., 1849.—J.S.

Supposed cholera-fungi.

of no particular importance, was made in relation to the Berlin epidemic of 1848 by Drs. Reinhardt and Leubuscher,* as afterwards in relation to the Bavarian epidemic of 1854, by Dr. Buhl.† In 1854 in London Dr. Hassall, after examining for the then General Board of Health "about 25" specimens of rice-water discharge, stated very definitely that "in none of the samples "were sporules or threads of any species of fungus present."‡

An interesting reference in the present point of view is to the writings of Professor Pacini of Florence; for this accomplished observer, on various occasions from 1854 to the present time, has described the choleraic process as consisting primarily in a destruction of the epithelium and villi of the intestines by an infiltrative vibrional development, and has argued that these vibriones and their germs—molecules of less than $\frac{1}{25000}$ of an inch in diameter, poured forth in millions in the discharges of the sick, must constitute the contagium of cholera.§ It seems possible that the difference between the *molecule vibrionali* of Pacini and the respective micrococci and spores of Hallier, Klob and Thomé, may really be only a difference of name. Not only Pacini, but many other observers whose microscopical examinations have been carefully conducted, have also mentioned with more or less stress the abundance of what they have called "vibriones" in the choleraic discharges. For instance Dr. Hassall, after making the statement which I have just quoted as to the forms commonly recognised as fungic, adds: "Myriads of vibriones were detected in every "drop of every sample of rice-water discharge hitherto subjected to examination. "Of these vibriones many formed threads more or less twisted, while others "were aggregated into masses which under the microscope presented a dotted "appearance." I may remark, too, that the microscopical observations made in England during 1866, though they have not reinstated any of the fungi of 1849, or brought to light any figures resembling the spore-cysts of Hallier, are not without interest in relation to the questions here under discussion. Thus, I would particularly refer to the few remarks made by Dr. Sanderson and Dr. Bristowe respectively [A] on the abundance of microscopical life which they found in the choleraic secretions of infected lower animals. And in the same point of view I would refer to Dr. Beale's papers in the *Med. Times and Gazette*, especially to that of August 18th, as representing, though with different nomenclature and different interpretation, much such an invasion of bowel epithelium by low organic forms as that which the German observers insist upon.||

Though I have thought it desirable for the scientific purposes of my report to advert very particularly to such statements as those which are mentioned in this portion of my appendix, I do not now venture to submit anything like a judgment on the very difficult eventual question which they seem to open. It appears to me that, before this can be done, not only the mere *biorama* (if I may so call it) of the intestinal contents, healthy as well as choleraic, will have to be studied far more extensively than it has yet been, and in all its accidental

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* In Virchow u. Reinh. Archiv, vol. 2, p. 414.—J.S.

† In Hauptbericht über die Cho.-Epid. d. Jahres 1854, pp. 504–6.—J.S.

‡ Appendix to Report of Committee for Scientific Inquiries, pp. 289–90.—J.S.

§ See Betti's *Considerazioni sul Colera Asiatico in Toscana;* Florence, 1858; vol. 5 pp. 333–334. Also Pacini's separate works: *sulla causa specifica del Col. Asiat.*, Florence, 1865, and *della natura del Col. Asiat.*, Florence, 1866.—J.S.

|| It deserves notice that Drs. Beale, Bristowe, and Sanderson, whom I believe to be three of the most trustworthy of observers, all (like Drs. Klob and Thomé) insist upon the active movements of the organic forms which they respectively describe, while Hallier apparently says that the minutest forms in his mycogony show none but passive movements.—J.S.

Supposed cholera-fungi.

variations, but also that, in the general study of zymoses, no doubt must remain as to the ætiological significance of the low organic forms which attend the chemical transformation. It strikes me as of the utmost importance, scientific and practical, that investigations should now be vigorously pressed in both of the directions adverted to. It may not be irrelevant to remark that, equally for eye and hand and intellect, such are among the most difficult of studies ; that they form a very special branch of work hitherto but little cultivated among medical practitioners in this country; and that the temptation to generalise as to them from some small field of observation is one which ought peculiarly to be resisted. The possibilities of error are numberless. Pacini quotes from Bloch a very graphic expression of the truth in calling this field of study the "infusorial "chaos" of the intestines. *Omne ignotum pro fungo* is of course a view less likely to be accepted in the present state of mycology than it may have been some 20 years ago: but any unpractised observer, going to work over-confidently in that "chaos," can scarcely fail to be a finder of mares' nests.

Finally, as regards Hallier's interesting reference to Dr. Tytler's doctrine of the origin of cholera in India, I may state that Dr. Tytler's views were published by him in London in 1833 in a pamphlet of 60 pages (long since out of print) entitled *Facts establishing the Deleterious Properties of Rice as an Article of Food*. Dr. Tytler's statements at the time excited very considerable interest, and were much discussed in medical societies and elsewhere. A very ample account, both of his statements and of the discussions which arose on them, may be read in Vol. I. of the *Lancet* for 1833–4.

From the Tenth Report to the Privy Council, 1867.

[The Tenth Report comprises sections relating to the Administration of the Diseases Prevention Act; the Regulation and Superintendence of Public Vaccination, which is omitted from the reprint, *vide* Vol. I., p. 370. The chief part of the report is that which treats of the inquiries, *Occasional* and *Systematic*, conducted in 1867. The portion of the report devoted to the *Systematic* inquiries comprises sections on the Distribution of Disease in England, and Particular Processes of Disease Investigated in Scientific Detail.—Ed.]

THE ADMINISTRATION OF THE DISEASES PREVENTION ACT.

Administration of the Diseases Prevention Act.

The Diseases Prevention Act, which in the summer of 1866 had been put in force by Her Majesty's Government on

Administration of the Diseases Prevention Act.

account of the diffusion of Asiatic Cholera in England, was kept in operation throughout the whole year 1867 by successive Acts of the same authority; and my Lords of the Council, on each of the half-yearly occasions when the Act was ordered to continue in force, provided that also the Medical Relief Regulations of 1866 (as given in the Appendix to my last annual Report) should continue. Those Regulations, for their first issue, had been carefully so constructed that their renewal from time to time should not make any further claim on local authorities for trouble or expense, except in so far as new outbreaks of cholera might arise; and, subject to this condition, it appeared better that the Regulations should continue in force, ready for immediate application to any such outbreak, than that risk should be run of emergencies perhaps to arise after their lapse. Fortunately the year 1867 passed without any noticeable repetition of the epidemic experience of 1866. In this state of the case a further continuance of the Regulations seemed unnecessary, and at the date of my present writing the Diseases Prevention Act has ceased to be in force.

INQUIRIES AND ACTION IN OTHER MATTERS.

The proceedings of the Lords of the Council in 1867, in that general relation to the interests of the Public Health in which the Act of 1858 appoints their Lordships to stand, were, as usually, of two sorts. In the first place there were proceedings of an essentially *occasional* sort, with reference to particular outbreaks or threatenings of disease during the year, or to particular complaints which had been made of dangerous nuisance in various parts of the country; and in the second place, there were proceedings of an essentially *systematic* sort, forming part of a plan of work which goes on connectedly from year to year. And of these two sorts of proceedings the following were the main facts.

1. *Occasional Proceedings.*

Occasional Inquiries.

On numerous particular occasions where complaints of the state of districts were made, or where outbreaks of endemic disease had occurred or were apprehended, my Lords during the year had correspondence, which was for the most part with local authorities, with regard to the administration of the Nuisances Removal and other common sanitary Acts. The authorities thus corresponded with were 113; including the 76 nuisance authorities of Wales, 10 of the vestries and district boards of the metropolis, 10 boards under the Local Government Act, and 14 boards of guardians.

In three of these cases, namely, in regard of Winterton in Lincolnshire, Guildford in Surrey, and Terling in Essex, local inquiry by an Inspector under their Lordships' direction was deemed necessary: these being the chief cases in which in 1867 a prevalence of typhoid fever constituted the matter of complaint. All three cases were in substance such as I have again and again reported on, as illustrations of excremental poisoning; and this filthiest chapter in the history of our pestilences is one which I would gladly consider myself exonerated from re-opening on the present occasion. As regards those for whom primarily my Reports are written—the makers and administrators and officers of sanitary law in England, it may seem superfluous that I again proceed to illustrate in some detail the dependence of typhoid fever on conditions which it is disgusting to specify. But while the evil continues—while annually in England some fifteen to twenty thousand persons are killed, and perhaps twenty times that number grievously sickened and endangered, by a disease which solely prevails through the pollution of atmosphere and drinking-water with excrement, the subject could not properly be set aside, unless Legislature and Government had already quite exhausted their powers in fruitless endeavours against the evil. I venture to believe that such is not the case; and purposing presently to invite judgment on this question, I shall briefly state here the leading facts of each of the three epidemics.

Typhoid fever in Winterton.

(i.) The little town of WINTERTON in Lincolnshire, having a population of about 1,800 persons, had for the last seven years been almost always suffering more or less from the presence of typhoid fever, and for the last two or three years the disease had been of great local importance. Sometimes it was more in one part of the town, sometimes more in another. In 1865–6 it particularly attacked a group of 35 houses at the west end of the town; and here, within the twelve months, out of 145 inhabitants 100 contracted the fever, and 17 died of it; or, in other words, those 145 inhabitants suffered in that year from the one preventable disease as many deaths as a population *seven times as great*, in fair sanitary circumstances, is expected to suffer *from all diseases and accidents put together*. Early in 1867 typhoid fever was again prevailing in large proportions in Winterton, but chiefly in another part of the town; and when their Lordships' inspector was there in April, there had been 55 new cases, and among them already 6 deaths. The cause of all this terrible sickness and mortality was of course evident to their Lordships' inspector at a glance. It was the merest question of filth. "The epidemic prevalence of fever " in Winterton," he writes, "is undoubtedly to be ascribed to " the disgraceful state of the privies, cesspools, ashpits, and " wells. . . . . Given, the existence of typhoid fever in a " town, it is hardly possible to conceive conditions more " favourable for its spread than these existing at Winter- " ton." Extracts which I append from his Report [A] contain copious details in support of the above conclusion. The conditions described are such as probably even the swine in the town may have suffered from; and it deserves notice that the scene of this disgraceful sanitary neglect was a town which four years previously had adopted the Local Government Act.

Typhoid fever in Guildford.

(ii.) The epidemic of typhoid fever at GUILDFORD was peculiarly instructive. Guildford is not ordinarily quite exempt from typhoid fever; and, during the first twenty-eight days of last August, 10 such cases had been seen scattered about in the town; when suddenly within the next thirty-three days there had arisen fully 250 cases of

Typhoid fever in Guildford.

the disease, and of this large number 150 had arisen within a fortnight. The distribution of the disease, especially during the first fortnight of the epidemic, so nearly corresponded in area with a particular section of the public water-supply of the town as to raise the strongest suspicions that this section of the water-supply was at fault. And eventually these suspicions became a certainty. First, namely, it was shown that on one particular day in August (about ten days before the beginning of the outbreak) 330 of the 1,675 houses of Guildford had *exceptionally* received their water from a certain high-service reservoir which had been previously filled from a new well; and that the persons residing in or frequenting these 330 houses constituted the part of the population on which the epidemic influence had almost exclusively fallen. Subsequent chemical examination of the water of the new well detected in it the products of organic decomposition; and examination of the local circumstances showed, but too unquestionably, whence the decomposing organic matter had been derived. The new well, no one could doubt, was most dangerously situated: in the porous and fissured chalk-stratum, it was within ten feet of various sewers; one of which indeed was traversed, as a short cut, by the iron delivery-pipe of the high service. And when, after the epidemic, this reckless confusion of sewer and water-works was dissected, the state of things found at the spot, was reported to us in the following terms by Mr. Taylor, one of the Poor Law Medical Officers of the town:—"The engineers employed in the repairs of the steam "engine noticed some exudation on the wall of the engine-"house next the alley where the sewer runs, and the pit of "the fly-wheel contained a notable quantity of the same. "As the exudation had the smell of sewage, the ground was "opened in the alley at a point adjacent to the engine-house. "The sewer was found leaking in various places, and the "soil between it and the wall of the engine-house was "saturated with sewage, of which as much appeared to run "outside as inside the sewer. This was found to be an old-"fashioned 12-inch drain constructed with red unglazed "gutter tiles, with butt joints and common mortar. The

Typhoid fever in Guildford.

" tiles forming the lower half of the cylinder were in places " completely worn away, and at one point several feet of " them were missing, and the upper tiles had fallen in upon " the soil below. All the joints gave exit to water, and the " ground was a quagmire of filth beneath and on each side. " Dark coloured fetid slush had to be dug out and removed " in baskets, making the men vomit who were employed in " the work."—There of course could not be any reasonable doubt but that the passage of this filth into the well, from which the high-service reservoir was filled, had been the cause of the epidemic. Mr. Taylor further informed us that the whole number of deaths from fever up to the end of the epidemic was 21, including three or four who died in other districts after removal from Guildford; and that he roughly computed the total number of cases of fever from August to December at 500.

Typhoid fever in Terling.

(iii.) The epidemic at TERLING, in Essex, was one of extraordinary dimensions. In that village of only 900 inhabitants, and for the most part within a period of two months, fully 300 persons were attacked with typhoid fever, and 41 of the number died. That is to say, the one preventable disease killed in that short time a larger proportion of the population than all causes of death put together ought to have killed there in two years. The conditions which rendered possible this most calamitous visitation of disease were, as in all our other experience, conditions of local filth. At Terling such conditions were at their worst. Round what pretends to be the house-accommodation of the tillers of the soil in Terling (a scanty overcrowded supply of dwellings of the meanest description) every possible source of pollution for air and water was accumulated; the peculiarly porous soil which underlay all this filth was of course continuously absorbing it; the water-supply of the population was derived from wells, most of them sunk in that excrement-sodden sponge of earth; some ten days before the outbreak of the fever, after an extraordinary period of drought, a sudden great rise in the water-level of the wells was observed; and this of course denoted a long-delayed scouring of that foulest soil into the water-supply of the now poisoned population. The

Typhoid fever in Terling.

epidemic incidentally deserved and received, for ulterior reasons, very particular scientific investigation; but my reference to it in this place is exclusively for practical purposes. The filth which did so enormous an injury to human life, existed under definite legal responsibility. The Nuisance Authority of the place (the Board of Guardians of the Witham Union) had most grossly neglected its duty. My Lords, in deference to what they believe to be the intentions of the Legislature, felt themselves bound to allow the Local Authority very ample opportunity even for tardy action; but when it became obvious to them that no sufficient use was being made of this opportunity, and that to spend further time in remonstrating with the Board of Guardians would not consist with due regard to human life in the district, their Lordships judged it necessary to move Mr. Secretary Hardy to put in force the compulsory provisions (Sections 16 and 49) of the Sanitary Act, 1866.

State of the law as to compensation of persons injured under the Nuisances Acts, &c.

I have already intimated that except for an immediate practical purpose I should not have thought it necessary again to give in one of my annual reports such extremely disgusting details as are here stated (partly in my last paragraphs, and still more fully in the appended reports of the inspectors) with regard to the local circumstances of our three chief fever-epidemics of 1867. But I have to raise a question which seems to me of the very utmost importance for the future sanitary progress of the country. And for the purpose of my argument I must refer to those three cases as types. They illustrate perfectly, but without any trace of exaggeration, the circumstances under which alone Typhoid Fever is empowered annually to kill so many thousands of our population, and to prostrate for months at a time so many scores of other thousands. Nor is this all. When cholera from time to time is among us, and its victims, during the short while of its prevalence, are counted in quick-succeeding thousands, like the slain and wounded of great battles, the circumstances of that pestilence are the same. The laws of its contagion in this country are substantially the laws of the fever-contagion: always there is

State of the law as to compensation of persons injured under the Nuisances Acts, &c.

the one story of filth: "excrement-sodden earth, excrement-" reeking air, excrement-tainted water, these are for us the "Causes of Cholera."* Now the point which I to some extent raised in my last report, as concerning the legal responsibilities of malfeasant water companies, is one to which I cannot but revert in connexion with our late Guildford experience: though now under slightly different circumstances, for on this particular occasion, as it happens, the water was purveyed by a local board. But the question which I am anxious now to raise is of very much larger scope than that formerly touched upon. It seems to me that the time has now come, when, not only as regards commercial water-companies, but also as regards local sanitary authorities, certain sorts of malfeasance should involve an obvious and unquestionable liability to pay pecuniary damages to persons whom the malfeasance has injured. I am not qualified to say that some liability to this effect may not at present be latent in our law: but I believe that at least it has never hitherto been judicially defined or affirmed: and it is evident that in this state of the case years may elapse before any aggrieved person, unless unusually rich and public-spirited, will be willing to incur considerable legal costs in testing his so doubtful claim to redress. I venture to submit that in this point of view the sanitary rights of the public are but very imperfectly secured, and that explicit legislation in the matter seems to me greatly to be desired. The effect of such legislation would be that what I may call *the fixed and finished parts* of sanitary science, as distinguished from those which are in any degree uncertain and speculative, would very rapidly become ordinary rules of conduct in civil life. In cases of alleged sanitary wrong, courts of law would have the facts in evidence before them; and judges and juries would determine whether wrong (in legal sense) had been done, and would assess the pecuniary damages in proportion. I would invite attention, in this point of view, to the three cases which are above reported. Apart from legal subtilties, on which I am not competent to speak, it seems that the

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* Extracts from Ninth report, p. 296.

State of the law as to compensation of persons injured under the Nuisances Acts, &c.

distribution of fouled water by the Guildford Board (regarded for the moment as a water-company) is as proper a case for judge and jury, on action for damages by any of the 500 people who had typhoid fever in the town, as any case in which a railway-collision brings some scores of passengers into harm; and the fact (as I believe it to be) that these water purveyors gave typhoid fever to their customers would be brought home to their consciences, and be suggested as a warning to other water-purveyors, in a far more conclusive and effective manner by such legal proceedings as I suggest, than it can be by any departmental statistics and remonstrances. Again, as regards the epidemics at Winterton and Terling:—under 29 & 30 Vict., c. 90, sect. 20, it is expressly the duty of certain local authorities that they make from time to time (personally or by their officers) inspection of their districts, with a view to ascertain what nuisances exist calling for abatement, and that they enforce, in regard of such nuisances, the provisions of the Nuisance Removal Acts. If cases like those of Winterton and Terling were before a court of law, and the propositions were affirmed (as I apprehend they unquestionably must be) that the duty of the authority had been utterly neglected, and that the sufferings of the population, or of parts of the population, had resulted from the neglect, "injury," in that legal sense which implies a title to redress, would have been done by the authority; and if hereupon each person who had suffered as above could recover his compensation from the rates, local authorities would immediately have the knowledge conveyed to them, in a far more practical form than it has yet assumed in their eyes, that sanitary neglect is a mistaken parsimony.

Apart from legal technicalities, on which I do not pretend to enter, the desiderata seem to me to be these three:—first, that for any purveyor of water wilfully or neglectfully to distribute foul water, or, where filtering is required, unfiltered water, and for any local authority to make default in such duties in relation to the public health as are by statute expressly imposed on it, should be (if they be not

State of the law as to compensation of persons injured under the Nuisances Acts, &c.

already) indictable offences, and that the production of disease by offences as aforesaid should be also (if it be not already) indictable; secondly, that it should be the province of some named central authority to take at its discretion legal proceedings against offenders as above; and, thirdly, that where such proceedings had led to conviction, all propositions affirmed in the verdict as to the causing of disease by the convicted person or authority at the time and place in question should afterwards be held proven for the purposes of whatever civil actions for damages might then be brought by private persons on account of injury sustained through the disease. It would of course in any action for damages be matter for question and proof whether the particular suffering had resulted wholly or in part from private fault, either in resistance to a local authority or otherwise; but looking to the spirit of our present nuisance-laws, especially to section 20 of the Act of 1866, I apprehend that nuisances on private premises could not *primâ facie* be deemed matters of solely private responsibility; and in regard of a large class of such cases, it may be doubtful whether an authority could quite exonerate itself of responsibility for the nuisances, even as against the owner of the premises, unless it showed that it had taken all proceedings required of it by law in such matters, or at least that the district possessed all proper facilities for the abatement of private nuisances. As regards such indictments as are above proposed, in which generally the indictment would be only for ulterior purposes, and the proceedings therefore only nominally penal, precedent exists in the indictability of parishes or other responsible parties for omissions to repair highways and bridges.

2.—*Systematic Proceedings.*

Systematic Inquiries.

The continuation of the systematic work which was previously in progress in the department, with the object of increasing our exact knowledge of diseases, involved during 1867 some studies which were in the highest degree interesting and important. These studies were of two different sorts, which it will be convenient here to distinguish.

DISTRIBUTION OF DISEASE IN ENGLAND, AND THE CIRCUMSTANCES BY WHICH IT IS REGULATED.

Dampness of soil.

I have to recall that in my last annual report a section to which I attached particular importance related to changes produced in the public health in certain towns where of late years improvements in drainage and water-supply had been made. The largest result of the investigation then reported on (an investigation relating to 25 towns, with an aggregate population of 600,000 inhabitants) was to show very strikingly the exemption which local populations obtain from cholera, typhoid fever, and other endemic bowel affections, in proportion as the local air and soil and water are kept free from excremental pollution: a result so confirmatory of much other evidence previously collected in regard of the same ætiological question, that henceforth apparently not even the most unwilling witness can deny the relation of cause and effect in that matter. But the inquiry had also some other results, of different degrees of value. And among such results one which stood in particular relief concerned the local distribution of PULMONARY PHTHISIS.

Relation of phthisis to dampness of soil.

It was evident, namely, that in some of the towns which had been improved the mortality from Phthisis had notably diminished. And when detailed examination was made of the cases which gave that indication, in contrast with the different class where phthisis had not been lessened in amount, it appeared that the diminution or non-diminution of phthisis depended on whether the sanitary improvements of the place had, or had not, included any considerable drying of the soil. In cases where this condition had been fulfilled, the reduction of phthisis occurred both too uniformly, and also in too great amount, to be regarded as of accidental coincidence. In a table then given, the reduction on previous phthisis-mortality, for the first 15 towns spoken of, was shown to be such as I now re-state in the adjoining table. And the fact that in some of the cases the diminished fatality of phthisis was by far the largest amendment, if not the only one, which had taken place in the local health, became extremely interesting

Relation of phthisis to dampness of soil.

The death-rates by Phthisis in the 15 under-mentioned towns had, after improved land-drainage, fallen, *per centum* as follows:—

Salisbury	49
Ely	47
Rugby	43
Banbury	41
Worthing	36
Leicester	32
Newport	32
Macclesfield	31
Cheltenham	26
Bristol	22
Dover	20
Warwick	19
Croydon	17
Cardiff	17
Merthyr	11

and significant, when the circumstance was remembered that works of sewerage, by which the drying of soil is effected, must always of necessity precede, and do indeed sometimes precede by years, the accomplishment of other objects (house drainage, abolition of cesspools, and so forth) on which the cessation of various other diseases is dependent. Thus, as regards the two largest populations which were reported on—those of Bristol and Leicester, no doubt the comparative smallness of effect hitherto produced on the general and diarrhœal death-rates of those towns might (so far as it was not fallacious) be referred to the shortness of time for which finished constructions had been at work for the detailed dispollution of houses and their dependencies; but a reduction already of a sixth in the phthisis-mortality of Bristol, and a reduction already of a fourth in the phthisis-mortality of Leicester, were apparently connected with the fact that in both towns main sewerage on a large scale, with more or less drying of soil, had existed, in comparison, for many years. And Rugby, which, long as it had been at work, had not yet succeeded in getting rid of endemic diarrhœa and typhoid fever, showed at least this result of its main drainage works, that its phthisis-mortality had fallen 43 per cent.

The above facts, though not enough in themselves to prove as certain the very important ætiological relation which they suggested, were at least amply sufficient to show that a very promising line of inquiry had been opened. And my Lords having on my representation been pleased to direct that this should be continued, Dr. Buchanan, the practised and skilful

Relation of phthisis to dampness of soil.

inspector who was engaged on the former general investigation, has now given me a further report of results obtained by him in a subsequent special research. That report presents an elaborate examination of the distribution of phthisis, as compared with variations of soil, in the three south-eastern counties of England, beyond the limits of the metropolis; and it confirms, I think, beyond any possibility of question, the conclusion, previously suggested, that *dampness of soil is an important cause of phthisis to the population living upon the soil.*

This conclusion, so far as it rests on the above evidence, cannot, strictly speaking, claim to be proven for any other countries than our own; and a supposition might be advanced, though of course with little probability, that perhaps we had only succeeded in discovering an influence special to England. It is therefore with much interest that I am able to quote the result of an inquiry (which indeed was made long before our own, though it has only recently come to my knowledge) on the distribution of Phthisis in some of the United States of America. It appears that in 1862, in an address delivered at the annual meeting of the Massachusetts Medical Society, and afterwards published, Dr. Bowditch, of Boston, U.S., drew attention, and not for the first time, to the remarkable inequality with which he had found phthisis to be distributed in Massachusetts, and, so far as he could ascertain, elsewhere in the States, and to the connexion of this inequality with differences of moisture of soil. He represented that "medical " opinion in Massachusetts, as deduced from the written " statements of resident physicians in 183 towns, tends " strongly to prove, though perhaps not affording perfect " proof of, the existence of a law in the development of " consumption in Massachusetts, which law has for its central " idea, that dampness of the soil of any township or locality " is intimately connected, and probably as cause and effect, " with the prevalence of consumption in that township or " locality;" and he also adduced particular instances as tending to prove that even "some houses may become the " foci of consumption, when others but slightly removed from

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"them, but on a drier soil, almost wholly escape."* It is moreover well worthy of notice that the Registrar General of Scotland in his 7th Annual Report, adverting to Dr. Bowditch's work, has stated that, in his opinion, the mortuary statistics of phthisis in Scotland furnish evidence to the same general effect. With those corroborative statements in aid of the evidence which this department has collected, it must, I think, be deemed extremely probable that the influence of soil is universal. But at any rate as regards England, of which alone I have officially to speak, the conclusion as to the influence seems indisputable.

Causes and preventability of phithisis.

In submitting this conclusion as one which, in my opinion, must henceforth stand among those scientific certainties on which the practice of preventive medicine has to rest, I take the opportunity of observing (though perhaps almost superfluously) that the conclusion does not purport to be more than a contribution to the ætiology of phthisis. That vastly fatal disease, if we are to have proper knowledge of its causes, must be studied from many different points of view. On former occasions (as particularly in my 4th and 6th annual reports) I have brought into relief the industrial relations of the disease, and now I insist on its occasional endemic relations. On those previous occasions it was shown to be a disease which undergoes development in proportion as men are *unwholesomely gathered in indoor industries*: now it is shown to be a disease which also develops itself in proportion as men are *dwelling upon a humid soil*. These two conclusions, no doubt, are very great ætiological fragments; but even when taken together they do not pretend to exhaust, or nearly to exhaust, the subject of the causation of phthisis. Thus, it may suffice me in passing to note that our studies of the disease have not yet touched its immensely important *hereditary relations*. And even in the present volume I shall

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* My quotations of Dr. Bowditch's work are from a second edition, which has quite recently been published in America:—"*Consumption in New England* "*and elsewhere, or Soil-Moisture one of its chief causes;*" Boston, 1868. We here, as Dr. Buchanan states, had been entirely unable to obtain a copy of the original work; and the copy of the re-issue, which I owe to Dr. Bowditch's kindness, has reached me only since the completion of Dr. Buchanan's report.—J.S.

Causes and preventability of phthisis.

directly have to bring under consideration another and entirely different aspect of the disease—that, namely, in which its intimate pathological affinities have to be discussed, and the *nature of the morbid process* which establishes it. That in both those directions the acquisition of further knowledge may very greatly increase our power of preventing a disease which now causes in England probably at least an eighth part of the entire mortality, will not, I think, seem improbable to anyone who well considers the subject; but meanwhile I may point with great satisfaction to the eminently practical character of the conclusions already obtained. Phthisis, so far as it depends on unwholesome circumstances of indoor industry, has, since my former reports, been made preventable under the law;* and phthisis, so far as it depends on wetness of soil, may easily in great part be made similarly preventable.

Distinction must, of course, here be drawn between populous and non-populous places. An undrained state of soil in any place where population is aggregated answers to the legal intention of the word "nuisance;" and I apprehend that, even in the present state of the law, the local sewer-authority is bound to provide that such a state shall not continue through want of proper constructions for the drainage. For agricultural lands, no doubt, the case is different. It may not be practicable to require that such lands, though damp enough to cause phthisis to the comparatively few and scattered persons who reside on them, shall be artificially drained by their owners; and the interests of agriculture in this respect are not always identical with those of human salubrity. But at least the law might unequivocally condemn, so far as detrimental to health, all damming of natural drainage. And for river-conservancies it would be a function, scarcely if at all less important than that of preventing the pollution of rivers, that they should also, as far as possible, prevent or remedy all such artificial and natural obstructions of water-flow as keep tracts of inhabited land sodden with stagnant wetness.

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* See Factory Acts of 1864–7, Work-places Regulation Act of 1867, and section 19 of the Sanitary Act, 1867.—J.S.

PARTICULAR PROCESSES OF DISEASE INVESTIGATED IN SCIENTIFIC DETAIL.

Investigation of Processes of Disease.

A very important branch of the systematic work of the department is represented for 1867 by the last two papers of my subjoined appendix [A], by Dr. Sanderson and Dr. Thudichum respectively. In my eighth report (pp. 215–8) I have stated the circumstances under which my Lords, early in 1865, determined that in future there should to a limited extent be conducted under their auspices such investigations in abstract pathology as might seem likeliest to be of ulterior effect in the more immediately practical and popular objects of this Department. The present is a time of the most extraordinary transition and progress in the sciences which are fundamental to medicine; so much so, that scarcely a month passes without raising some new pathological question which bears upon principles of action; and this Department, practically considered, would be lagging far behind the knowledge which ought to be represented in its administration, and might often be spreading mere obsolete error among persons who look to it for intelligence, if it were not itself able to submit such questions to examination, and thus and in other ways to take part in the scientific reconstruction which is in progress. The application of work of this description is, as I need hardly observe, in the first instance exclusively technical: the work addressing itself primarily to certain scientific requirements of the medical profession, and not pretending to be applicable to popular uses so immediately as the other work of the department: and, in this state of the case, it is not necessary that I should here enter, except briefly, into a discussion of the subject-matter of last year's investigations. Some short explanation, however, may be convenient.

Inoculability of Tubercle.

(*a*.) Dr. Sanderson's report relates to the process by which so-called *Tubercular Disease* is established in the animal body—such disease as, for one of its forms, is illustrated in Pulmonary Phthisis, and which, in that and other forms, is

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among the most fearful scourges of human life in this country. The morbid process, terribly frequent as it is, has not yet come to be well understood. Of its chemistry (which may probably hereafter prove to be the true criterion of its nature) absolutely nothing is yet known. Of the way in which its best recognized external causes become capable of engendering it in the human body, we can scarcely be said to have a conjecture. And even of its anatomy (though this of late years has been more successfully investigated) the facts are not yet nearly complete. On the other hand, its relation to some other diseases had long seemed, in a very general sense, to be tolerably sure: it had been assumed for instance—and the assumptions are represented in our commonly received classifications of disease, first, that the process must consist in "specific," as opposed to "common inflammatory," local changes; and then that the root of these changes must be something so inherent in the original nature of the sufferer, and so independent of any contagious influence, as to make tubercle the type of so-called "constitutional" diseases, in distinction from all extrinsic, and particularly from all "zymotic," diseases: but even while these assumptions were not openly contested, considerations were accumulating which caused every cautious pathologist to speak with great reserve on the subject. In this state of the case, suddenly, some two and a quarter years ago a very startling discovery was announced. Dr. Villemin, of the Val de Grâce Hospital in Paris, on the strength of a large number of experiments which he had performed on some of the lower animals, claimed to have established that tubercle is inoculable from subject to subject, and is in fact as "zymotic" as syphilis. Various observers (among whom I was one) were soon able to satisfy themselves that M. Villemin's descriptions were entirely true for the field within which he had experimented; but it was evident that no general view could properly be based on results such as his, till the answers to many other questions should have been brought within the field of study; and as the line of inquiry which he had opened would at any rate almost certainly involve immense pathological consequences, the more comprehensive research was peculiarly to be desired. My Lords, Inoculability of Tubercle.

early last year, were pleased to authorize that such a research should be undertaken on a large scale in this department. One great portion of the consequent work is represented in Dr. Sanderson's present report, and other portions of it (with a view to my next annual volume) have already been committed to him for completion. The results which have hitherto been reached are not in an unqualified sense final; but even this first stage of the inquiry, besides leading as it does to ulterior questions of the utmost interest, has already given us definite and important knowledge.

The conclusions to which hitherto we have come may be stated as follows. First, M. Villemin's fact is established as unquestionable: certain of the lower animals, if inoculated from the human subject with the morbid products which are called "tubercular," will in consequence develop, more or less extensively throughout their bodies, a disease, which, so far as present criteria can decide, is identical or nearly identical with the so-called "tubercular" disease of man: and from this fact, taken with previous knowledge as to the mode in which "tubercle" in man tends to spread infectively from its original site to secondary and tertiary sites in the affected body, it would at first seem that human "tubercle" must be a specific zymotic disease. Against this, however, the correction has to be applied, that, in the rodent animals on which hitherto an immense majority of the inoculative experiments have been performed, a disease, which, if it were in the human subject, we should unhesitatingly call "tubercle," may certainly and (it seems) very easily arise in continuation of "common inflammatory" phenomena; that not only the "tubercular" inoculation from man, but other morbid inoculations, and even "common" local lesions, may be followed by diffuse tuberculisation of the rodent's body; that, for instance, a slight open wound, such as that of a seton run beneath the skin, is not, as in man, an affair of simple irritation which ceases when the irritant is withdrawn, but is capable of being the first step in a series of changes which gradually infect the creature's whole body with imitations of the human "tubercular diathesis," and thus at last create such "tubercular" disorganizations as necessarily destroy life.

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Here, for the present, we stop, and it would be idle to conjecture what further knowledge may hereafter be gained in this very instructive line of inquiry. I may venture, however, to point out that some of the present observations, in converse as it were to their first teaching, prompt a curious second reflexion. They suggest, namely, a speculation with regard to human "tubercle," such as may indeed extend to many human diseases which are called specific and zymotic, whether perhaps our pathological terms "common" and "specific" may not, more than has yet been supposed, be found variable with the particular animal spoken of as affected, rather than attaching fixedly to the given diseases; whether, namely, the "common "inflammatory" affections of some animals may not be the "specific" affections of others; whether, for instance, some "common" traumatic affection of this brute or that may not correspond in essential chemistry to this or that "specific" zymosis of man, and even in some cases be the source whence the latter was first derived. Of course no speculation of this sort can be conclusively argued till our present imperfect scientific definitions of morbid processes shall have been very greatly improved.

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(*b*.) Dr. Thudichum's report, even in some respects more than Dr. Sanderson's, represents only part of an unfinished work of the department: but here the projected work is so large and heterogeneous that of necessity its separate sections must often be regarded as wholes. The scope of the entire work is an endeavour which my Lords are making in this department to contribute towards the establishment of precise knowledge in those chemical aspects of pathology where at present there is almost utter darkness. It is only among persons who are fairly conversant with the present difficulties of the medical sciences that the full obstructiveness of that defect can be measured. It means, alas, that very large parts of practical medicine, both preventive and curative, are even yet in a state of grievous imperfection. Both within and without the profession, certain general words which have become current are apt to convey erroneous impressions on that subject. With our various infectious "fevers," for instance:—we state that they have, as

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their common and probably essential character, an extraordinary development of contagious chemical activity (or, as we call it, "fermentation" or "zymosis") in the affected body; but behind these general words there is so little exact knowledge, that we have not the remotest conception wherein the "chemical activity" of smallpox differs from that of scarlatina or of typhus, or what is the chemical difference between their respective fevers and the fever of a broken leg or skull. Similarly with our so-called "dyscrasies":—we are ready to tabulate together under that old Greek word a large number of diseases of which we think we know that they represent habitual indolence, or other chronic misbehaviour, in the chemical working of the body or of certain organs—such habits of body as the gouty, the scrofulous, the rheumatic: but not of one of these dyscrasies, not even of the most studied of the number, are we yet able to give any description which a chemist would recognize as intelligible. And this, be it observed, is in regard of diseases which by common consent are either primarily, or in a high secondary sense, chemical. Of course a third group might be cited of other diseases which also (like the above) present very prominent chemical phenomena, but which hitherto are so imperfectly known in this point of view that we hesitate whether to call them dyscrasies or not: such diseases as cancer, rickets. Here in short is a large number of our most important diseases, for which hitherto we have not even approximately got proper pathological definitions. And the evil of this is not only that in our purely scientific discussions we are again and again brought to a standstill by the embarrassment of undefined terms;* but also the defect which I describe lies at the very root of what is now least satisfactory in our practice. What we want in respect of our morbid processes, so far as they concern the chemistry of the body, is to be able to define them in

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* For instance, some two years ago, when the cattle-plague began to be much talked about here, public discussion arose whether the disease was of such nature that it ought to be called bovine smallpox; but this discussion was (I may venture to affirm) simply futile, as no one could define "smallpox" in any sense which would supply a reasonable standard for the comparison. And the same sort of thing is illustrated to some extent in what I have written in the preceding section as to the communicability of "tubercle." For, what is tubercle?—J.S.

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precise chemical language: to be able, for instance, as regards any disease which is rightly considered zymotic, to say that the bodily materials which it specifically affects are such and such, and that in the disease these materials pass through such and such stages of transformation, ending in such and such results: and to be able to express all this in as exact chemical terms as we apply to vinous or butyric fermentation. Failing this, we have no final pathology of such cases as are in question; nor is it likely that we should have for them, except by accident, any radical treatment or prevention. No doubt there may be lucky successes, as where we inherit specific antidotes or half-antidotes, more or less uncertain, for gout, or syphilis, or ague; and there are the many far different successes, where the skilful practitioner with treatment which is confessedly but provisional and palliative (though not on that account the less scientific) avails himself to the utmost of present symptomatological knowledge, and watchfully resists disease in the detail of each special influence by which it proximately tends to shorten life. But the total of these various successes leaves still much unsuccess to be deplored; and probably those who are most efficient in administering the present resources of medicine would be of all persons the most conscious how limited in some directions, and specially in such as I am now considering, are the resources which are yet at their command. And evidently for future progress, the possibilities of medicine are but two: on the one hand we have the chance, such as it is, that from time to time new specific antidotes may accidentally be discovered; on the other hand, there is the power of deliberate scientific discovery and application. The latter, in regard of such chemical diseases as are here under notice, must presumably, in some or all of the most important stages of its development, be a question of purely chemical work; and it would, I think, be unwise to assume in respect of any such chemical case, that the ends of preventive and curative medicine can be reached till our practical proceedings shall have got to be demonstrably based on the very chemical formula of the morbid process.

There is here of course no intention to depreciate in even the smallest degree the services which other kinds of observation

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and experiment as to the forms and forces of health and disease may render, and have rendered, to medicine. Every step in the physiological sciences, every better knowledge of the organs of the living body, and of their material and functional fluctuations under whatever influences, is of actual or potential gain to us; and such knowledge, even where it sometimes tends but little to the final interpretation of disease, constantly gives more and more success to the provisional practice which it enlightens. As regards the anatomical studies of late times, with the very advanced utilisation of the microscope, and the otherwise greatly improved means of minute structural investigation, I need hardly say that, by them, during the last thirty years, great parts of the science of disease have been completely transfigured, and that even now from year to year this mode of inquiry continues to give most valuable results. How much importance is attached to it in this department is indeed illustrated in the present volume by the minuteness of anatomical research with which Dr. Sanderson's report is written. But one of the best lessons which any science can teach us is enabling us to see what are the necessary limits of its own teaching-power; and thus by help of the microscope we have come to learn, in respect of a vast number of the most important problems of pathology, that what it can teach is only generic, while what we want to know is special, that diseases practically most dissimilar may be indistinguishable in ultimate anatomy, that our few simple types of structural change are but vague and most imperfect symbols of the innumerable chemical changes which they embody. Nor, as regards the zymotic diseases, do I undervalue the great scientific interest of such investigations as I last year quoted from Prof. Hallier in respect of cholera, and might now quote from him in respect of several other such diseases, as tending, in his belief, to establish that micro-fungi of various sorts constitute zymotic contagia; but, however great may be the future development of such investigations as those, and however unquestionable their results, the field in which such knowledge might prove applicable is one where in most instances the interest of the microscopic ferment would be

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practically as inseparable from the chemical study of the disease, as the interest of the yeast-plant is inseparable from the study of the decompositions amid which it lives.

The above, in substance, are views which I have for many years entertained and expressed as to the very great need of chemical research in aid of such practical objects as those with which this department is charged: but till very recently such researches could not have had much promise of success: and it was only three years ago that I felt justified in asking my Lords to allow me special assistance for an attempt to lessen the defects of which I complain.

Of the work which since then has been done for the Department by Dr. Thudichum, part was represented in my last year's volume by a report on the chemistry of cholera, and another considerable part is represented in this year's volume (Appendix). The medical reader will see, without surprise, that a large proportion of the present work is of a kind which may almost be called preliminary; partly that it deals with those sections of physiological chemistry with which our great patho-chemical problems are most nearly related, and in which, essentially for our purpose, very exact standards of healthy chemical process have to be ascertained; and partly that much study is given to artificial and post-mortem processes which in some degree resemble processes of disease. The more direct researches have brought into strong light (as may particularly be seen in section 3 of the Report) the necessity which caused that course to be taken. The present researches, besides investigations of particular morbid phenomena, have chiefly related to the decompositions of albuminous substances, to the coloured corpuscles of the blood, and to the coloured ingredients of bile and urine. It has been found convenient to prefix to the account of these researches a compendious introductory view of the present state of the case to which the researches apply; or (as the title of the section runs) a "sketch of chemical physiology, and of its "points of contact with pathology." Further the spectroscope has proved so essential an instrument of investigation as to require particular notice in the report; and, therefore, the information given as to the spectroscopy of the blood is preceded by some general information as to the construction and uses of the instrument. Also the report has a supplementary section on alcohol and its relations to the human body; particularly in settlement of the much-debated medical question whether alcoholic drinks contribute to nourish the body into which they are taken.

From the Eleventh Report to the Privy Council, 1868.

[The Eleventh Report comprises sections relating to the Public Vaccination System, which has appeared in Vol. I., pp. 370–4; General Sanitary Administration; Auxiliary Scientific Investigations; Additions to Sanitary Law, which has appeared in Vol. I., p. 550; the Question of State interference to provide for the Disinfection of Prostitutes; the Question of consolidating and bringing into system the laws and administrative agencies which concern the Public Health. —Ed.]

GENERAL SANITARY ADMINISTRATION.

Occasional sanitary inquiries.

During 1868, as usual, in various cases within purview of the general sanitary laws of the country, my Lords had to communicate with the respective local authorities concerning action to be taken under those laws. The authorities thus communicated with were 50; including 14 of the special boards of the metropolis, 5 extra-metropolitan vestries, 15 boards under the Public Health and Local Government Acts, and 16 boards of guardians. In seven of the cases, local inquiry by an inspector under their Lordships' direction was deemed necessary, viz., at Walton-le-Dale in Lancashire, at Bootle in the same county, at Thetford in Norfolk, at Clifton-Hampden in Berkshire, at Barnet in Middlesex, at Luton in Bedfordshire, and at Dunstable in the same county.

Systematic sanitary inquiries.

In the systematic sanitary inquiries which my Lords have for ten past years been carrying on, as to the distribution of disease in England and the circumstances by which it is regulated, there was in 1868 an almost complete pause; owing in some measure to the fact that the working power of the department was accidentally for the while much reduced; and in other part, because with the present commencing second decennium of sanitary responsibility, a new cycle of work had to be begun, and a great deal of consideration had to be given to questions of improvement of system.

Sickness treated at public expense.

The department has, however, been indebted to Dr. Ballard, medical officer of health of the parish of Islington, for a very interesting voluntary contribution to knowledge, in the form of a report on the statistics of sickness treated at the public expense in Islington during the last 12 years; and this report by Dr. Ballard is subjoined [A].

Venereal diseases in London.

The only respect in which my Lords in 1868 extended their previous series of systematic inquiries as to the distribution and circumstances of disease, was an inquiry concerning the prevalence of venereal maladies among the poorer parts of the civil population in London; and for this inquiry Mr. Wagstaffe, one of their Lordships' inspectors, collected some detailed information which is given in his subjoined report [A].

AUXILIARY SCIENTIFIC INVESTIGATIONS.

Pathological investigations.

The pathological work of the department was continued during 1868 in both of the directions to which I referred in my last yearly volume; and details of this work are given by Dr. Sanderson and Dr. Thudichum in their respective subjoined reports [A]. Dr. Sanderson, continuing from the previous year the very important investigation of tubercular disease, has now succeeded in throwing new light upon a large part of that subject-matter; and Dr. Thudichum in the chemical field of research, has made considerable further progress in continuation of the line of 1867.

QUESTION OF STATE INTERFERENCE TO PROVIDE FOR THE DISINFECTION OF PROSTITUTES.

Proposals to extend the operation of the Contagious Diseases Act, 1866.

The inquiry of the department into the prevalence of venereal diseases among the civil population was intended to contribute some of the elements necessary for judging a question which of late has been much agitated before the public: the question, whether it is expedient to have in this country a systematic sanitary superintendence of prostitutes. During the last few years, under the provisions of special Acts of Parliament—the so-called *Contagious Diseases Acts* of 1864 and 1866, a system of this sort has been administered on a small scale, by the War Office and Admiralty, at certain military and naval stations; and recently, while these departments have been proposing to extend their own operations with respect to the two public services which they direct, the more general question has been raised by the advocacy of a voluntary association formed for the purpose of promoting the extension of the Contagious Diseases Act, 1866, to the civil population of the United Kingdom.

Special case of Army and Navy, as distinguished from that of Civil Population.

There are here two questions which I think cannot be too strictly distinguished: the question concerning the army and navy, and the question concerning the civil population. It has not been any part of my duty to advise on the former of these questions; and I now only advert to it for the sake of greater clearness in proceeding to discuss the other. It seems to me that prostitution and its attendant diseases, in their relation to the army and navy, are, in two different points of view, matter of public concern and responsibility; first, because the military and naval services at their respective stations are essential determining causes of prostitution, and the State, which for its own purposes keeps those masses of male population unmarried, cannot claim to be indifferent to the result; and, secondly, because the specific diseases which arise in that mode of life occasion so enormous a quantity of temporary disablement in the two services as to be of pecuniary importance to the entire tax-paying community. These I apprehend are the grounds on which rests all that has yet been done by the Legislature with reference to venereal diseases: grounds which are in the utmost degree exceptional as regards the nature of the case: and to argue from such a case to the case of the civil population would manifestly be a confusion of judgment. Of the venereal diseases of the civil population, English sanitary law has not hitherto taken any special cognizance; and whether this neutral state of the law ought or ought not to be abandoned is a separate question, of far more intricacy than seems to be generally imagined, and which on all accounts certainly deserves most careful consideration.

Requirements involved in proposal concerning civil population.

In proceeding to discuss this question, I may conveniently first refer to the programme of the association which I have mentioned—the "Association for Promoting the Extension of "the Contagious Diseases Act, 1866, to the Civil Population "of the United Kingdom." The Association contends "that "sufferers under any kind of [venereal] contagious disease "are dangerous members of society, and should, so long as "they are in this state, be prevented from communicating it "to others; ... that common prostitutes should be subject "to a compulsory medical examination, and to compulsory "detention in hospital as often as they are found diseased, "and as long as they continue so; ... that, for the reception "of prostitutes suffering from venereal disease, hospital accommodation should be provided in all towns where such "persons congregate."* To give a notion of the quantity of hospital accommodation which would be requisite to satisfy this programme, I may observe, for instance, that London is conjectured to have some 18,000 women whose living is gained by prostitution;† and that, according to one of the secretaries of the society, on any given number of prostitutes, always about one-third may be assumed to be diseased.‡ If, instead of insisting on these colossal estimates, we take only half their total result, the plan would require for London alone the creation and maintenance of new hospital accommodation nearly equal to that which is now given by the twelve general hospitals of London for all bodily diseases put together: accommodation, namely, for 3,000 patients. The charge of maintaining (independently of the cost of constructing) such lazarets as the above would probably be at least 100,000*l.* per annum: and their construction would probably represent a first cost little short of half a million of money: besides all which there would be the considerable annual charges for police arrangements and medical inspections. This for London alone! And the requirements of other large towns would probably be of like proportions.

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* Report of Association, sections 2, 33, 32.—J.S.

† Appendix of Assoc. Report, p. 22.—J.S.

‡ Mr. Curgenven, on the Contagious Diseases Act of 1866, p. 7.—J.S.

And how, and by whom, to be met? and on what grounds?

Demands like the above are evidently not likely to be met by voluntary contributions. The result, if to be got at all, can only be got under action of law; and any such law, whether empowering the central government to defray expenses out of proceeds of general taxation, or empowering municipalities to assign local funds for the purpose, is, of course, in relation to minorities, compulsory. Now, it is quite certain that, rightly or wrongly, the proposed appropriation of money would, in the eyes of very large numbers of persons, be to the last degree odious and immoral. In most municipal constituencies there are swarms of persons who already find it no easy matter to satisfy the collectors of rates and taxes; they would see the prostitute kept in hospital at their expense for weeks or months, not necessarily from the exigencies of severe illness of her own, but essentially that she might be made clean for hire; they would remember in contrast, that for themselves wonderfully little is done by authority to protect them against adulterations of food, or against false weights or measures; and they might regard it as a strange caprice of law which should oblige them to contribute to the cost of giving an artificial security to their neighbour's looseness of life. It seems to me very important to measure beforehand the degree in which such arguments would be valid, or rather to consider on what principles (if any) the proposed intervention of law is to be justified.

I suppose it may be assumed that public policy is very decidedly in favour of marriage as against promiscuous fornication; that the latter, however powerless may be laws to prevent it, is, at least, an order of things which no State would willingly foster; that, whereas it has some inherent inconveniences, among which is the liability to specific contagious maladies, such drawbacks from its attractions are not in their kind a matter for general social regret; that venereal diseases are, in principle, infections which a man contracts at his own option, and against which he cannot in any degree claim to be protected by action of others—the less so, of course, as his option is exercised in modes of life contrary to the common good; that thus, primâ facie, the true policy of Government is to regard the prevention of venereal diseases as matter of exclusively private concern. *Caveat emptor!* And though it must be admitted that to some extent the consequences of promiscuous fornication spread, the infections of the brothel being oftentimes carried into simultaneous or subsequent wedlock, and in some cases fixing their obscene brand even on the offspring of such marriages; this horrid fact is only one of many which might be cited, where innocent wives and children participate more or less severely in consequences which husbands and fathers have earned. To be wife or child of a drunkard or a gambler involves evils against which the State does not affect to give security; and, primâ facie, the dependent interest must be equally unprotected by the State against harms which that other sort of looseness may bring on it.

Primâ facie, venereal diseases are not any concern of Government;

I am very far from thinking that the above are the sole considerations to which regard must be had in deciding such questions as the present. But they seem to me to define a position which ought not to be abandoned, except under strong compulsion of circumstances, and with reasonable prospects of success. Evidently, if venereal diseases were now the same gigantic scourge and terror which they were some 350 years ago, when they inspired Fracastoro's poem, and if curative medicine had continued as powerless against them as then: if we saw them still raging as great intractable epidemics, impeding national movements, and forcibly occupying the mind of society with all sorts of lazarous presentations: the reasons for legislative action,

but this with qualification.

provided such action could be effectual, might be stronger than the reasons for neutrality, and considerations as to the personal ætiology of the disease might perforce have to be subordinated to the urgency of a public danger.

Medical grounds on which the proposal has to be judged:

The cardinal questions, then, are two:—First, does the detriment which venereal infections cause to the public health reach those limits at which principles generally preferable ought to be exceptionally abandoned by the State? Secondly, would the good which can be got through State interference in this matter be enough to reasonably compensate for the cost at which it would have to be attained? I must confess that I cannot with any approach to confidence answer either of these questions affirmatively. As regards the first of them, I have not the least disposition to deny that venereal affections constitute a real and great evil for the community; though I suspect that very exaggerated opinions are current as to their diffusion and malignity; but since the resources of curative medicine against them are constantly becoming stronger and stronger, it seems probable that the worst of them will year by year become less and less important (as endangering life or limb) in cases where infection may obtain. It may also be anticipated that the greatly improved knowledge which late years have given to the medical profession with regard to the venereal contagia will spread, and not very slowly spread, through the minds of the general public, and will soon very much reduce the number of those sad cases where infected men give syphilis to their wives and offspring. On the other hand, as regards our power of preventing venereal diseases by such a superintendence of prostitution as is proposed, it is certain that no appreciable good would be got except with much organization, and at very large cost of money; and there are strong reasons for believing that the gain so purchased would, on analysis, be found to belong very predominantly to those kinds of venereal disease in which the community has little or no permanent interest.

what is the magnitude of the mischief?

First, as regards the actual quantity of venereal disease current in this country, and the importance of such disease to the public health, it is to be remembered that under the head of "venereal diseases" are included three chief sorts of disease, and of course in each sort many different degrees of severity. The three sorts to which I refer, and which in any given person are not incompatible with one another, are gonorrhœa, pseudo-syphilis, and true syphilis. *Gonorrhœa* is never even temporarily of much importance to women, nor ever, unless very exceptionally, of much permanent importance even to men; but yet thus far it is not a quite unimportant infection, that in men it is often extremely inconvenient, indeed sometimes involves for a time painful and even disabling complications, and cannot absolutely be said never to leave permanent local damage behind it. *Pseudo-Syphilis*, or so called "simple chancre," is a form of ulcer which may be of considerable local destructiveness, and is often attended by inguinal buboes, but leads to no specific ulterior consequences. *True Syphilis*, arising as "hard chancre," or in other less characteristic primary affections, involves an outbreak or successive outbreaks of so-called "secondary symptoms;" which, though almost invariably amenable to medical treatment as they arise, and probably in an immense majority of cases not of more than transient importance to the person attacked, are yet not infrequently a more or less troublesome relapsing illness, and sometimes, even in spite of treatment, a long subsequent danger to life; and this true syphilis is of permanent interest to society, partly because of the cases (though comparatively very few) in which it is intractable in the person of the original sufferer, but still more because of the indefinite duration of time for which he or she may at intervals be capable of infecting others, and because the issue of syphilitic parents is apt to perish during utero-gestation, or to be born more or less syphilitic. In seeking to estimate, without exaggeration, the harm which society suffers from venereal diseases, and the good which preventive measures may possibly effect, it is, of course, essential to observe the distinctions between the above-described three sorts of disease: above all not to use the word "venereal" as if it were synonymous with "syphilitic;" and it is also essential that whatever purports to be statistical evidence on the subject should be evidence on a sufficiently large and impartial scale. The report of the "Association for Promoting "the Extension of the Contagious Diseases Act to the Civil

"Population" gives some statistics which might lead to an impression that in London from one-fifth to one-third of the sick poor are suffering from "a contagious disease of the "gravest character, which is constantly transmitted from "parent to offspring;" but the contents of Mr. Wagstaffe's subjoined report [A] satisfy me that no sufficient grounds for any such impression exist: rendering it, I think, highly probable that, of the sick poor who at any given moment are receiving medical relief under the poor law and at dispensaries and general hospitals in London, only about 7 per cent. have venereal disease of one kind or another, and that only in about half this proportion the form of disease is true syphilis. Again, a piece of the experience of the Children's Hospital in Great Ormond Street, as quoted in the report of the Association, may seem to suggest that "about "one-fifth" of the sick children of the poor are sick with immediate consequences of inherited syphilis; but on inquiry I find that, of 118,590 children of the poor treated during the last ten years for all sorts of diseases at the Ormond Street Hospital, the proportion recorded to have been syphilitic has been only 1½ per 100. Thus, in both cases the quantity of evil appears to be many times less than advocates of legislative interference may imagine; and it must be remembered that London probably illustrates the utmost dimensions which the evil can attain in this country.

how far is the mischief preventable?

Then, as regards the preventability of venereal diseases, even the abstract question (abstract I mean from considerations of cost) is by no means an easy one. Especially we are in want of exact discriminative information as to the good which other countries have got from their sanitary superintendence of prostitution. I believe it to be the fact that, even under strict systems of police, prostitutes in very large proportions escape the intended supervision; and that in their evasive traffic so large a dissemination of venereal diseases may be kept up as to leave in net result very little apparent success to be boasted of. Let it be assumed, however, that, in any place where circumstances are favourable, "venereal diseases" in mass may be greatly reduced under such a system: but there remains as an unfortunate accident of the case, that this reduction might least of all affect those sorts of disease in which society is incomparably most interested; and in the absence of exact records on this point, expectations ought, I think, to be very moderate. For the various local states which most habitually spread the infection of true syphilis are apt to be in themselves such slight and painless affections as almost or entirely to escape the patient's notice; and indeed in women primary syphilitic ulcers, and other local states capable of infecting with syphilis, not only very often pass unnoticed by the patient herself, but have often been overlooked in examinations made expressly for their discovery. And with reference to proposals that particular inspections of women should take place on the information of men whom they have infected, insuperable difficulties are created in the case of true syphilis by the very long incubation-time of the primary infection: an interval generally of at least three weeks, and capable apparently of extending to six weeks or more: during which time the inoculated part presents absolutely no sign of infection; and at the end of which time the infected man may (for obvious reasons) be in utter ambiguity as to his infectress.

and with what difficulties? and at what proportionate cost?

When the question of preventing venereal diseases is considered as one of administration and finance, some of the above facts become important difficulties. It is proposed that the organization should take equal cognizance of all sorts of venereal disease: indeed this, if the organization were in existence, would seem practically inevitable; partly because of uncertainties and precariousness of diagnosis; partly because cases, taken in the order of their permanent interest to society would very often be in inverse order to that which the relative urgency of personal sufferings would dictate. And thus, so far as the extinction of true syphilis is to be deemed the essential object of the system, the organization would in two ways tend to be disproportionately expensive: on the one hand, because expending a very large share of its strength on diseases of no permanent importance to society, and, on the other hand, in such measure as cases of true syphilis would escape the intentions of the system.—Further, when the administrative question is considered, not as national and one, but as distributed among many local authorities, a new sort of difficulty presents itself. Whatever good can be got from a sanitary superintendence of prostitution, if worked with uniform strictness through the entire country, the good will not only of course diminish, but will diminish at an immensely increasing rate of diminution, in proportion as the system is not universal and uniformly strict; so that a local expenditure which would give remunerative results, if other places were acting on the same system, might easily, in the contrary case, appear comparatively unproductive. This has been a chief point in the case of those who have pressed for an extension of the present venereal diseases law; and the Association's report has for one of its chief texts, "Free communication between localities, "fatal to success of Act in limited districts."

Practical conclusions:

The broad result in my mind from the various above-stated considerations is that at present I very decidedly refrain from recommending any change in that neutral position which English law has hitherto held in regard of the venereal diseases of the civil population. So far as my present knowledge enables me to judge, I believe that any departure from that position could do little but embarrass and disappoint.

as to compulsory legislation;

That under a well-planned national system, obligatory in its local operation, and stringently directed from the centre, with an enormous establishment of lock hospitals, with prostitution universally submitted to strict methodical supervision by police, and with very frequently recurring minute surgical examination of the persons of prostitutes, a great reduction might be made in the present prevalence of venereal diseases among the civil population; and that as part of such reduction (though probably in comparison but a small part) there would be a diminution in the prevalence of true syphilis; these are propositions which I do not dispute; but their very important converse has to be remembered, that, in proportion as the above conditions cannot be attained, the hope of results becomes chimerical. The conditions, I need hardly observe, are such as there can be no reasonable present expectation of seeing realized in this country; and I must add that, in the present state of my knowledge, I could not advocate any such legislation as would even approximately fulfil them. Not only do I doubt whether the evil can in any reasonable sense be said to call for the repugnant and very costly measures of prevention which alone could pretend to be of effect against it, but also I feel bound to press for something like proportion in the treatment of such matters. And recognizing how incomplete is hitherto our sanitary system, and particularly how little pressure is yet put on local authorities in matters of far more general importance to life: recognizing, for instance, that it is almost entirely a question of private charity whether fever hospitals exist in a town, and that such hospitals are most insufficiently provided: I cannot but think that during this state of things compulsory legislation in the present matter would be a disproportion not to be justified.

as to giving option to local authorities;

On the other hand I have to observe that the somewhat uncertain amount of good which very strict compulsory legislation might produce would less and less admit of being realized, in proportion as the provisions of law were non-compulsory; and a law, giving to local authorities or populations any considerable scope for option in the present matter would quite unquestionably be futile. Everyone knows how valueless such legislation has been in the greater part of the hitherto province of sanitary law, even as regards objects of foremost necessity to the public health; so valueless, that in all chief respects compulsory legislation has already had to be substituted for it; and the light of those experiences may be applied, mutatis mutandis, to the present extremely difficult and delicate subject matter. There probably would be detailed discussions, often indefinitely prolonged, and resulting in inharmonious conclusions, in innumerable vestries and town-councils and wardmotes; discussions which, if not to bear fruit, ought in the interests of decency to be deprecated; but of action, capable of giving success, there certainly would be little or nothing. It is true that under permissive law there have been exceptional instances of local exertion for other sanitary purposes; but even solitary instances of such exertion could not in the present matter be anticipated; for here the peculiar discouragement would exist, that no town could be sure of satisfactory results from its own superintendence of prostitution unless other towns, in communication with it, were acting upon the same system.

as to legislating for a voluntary system;

In a particular proposal, which I think it my duty to mention, permissive legislation, of a sort which would almost entirely rest on a system of voluntary contributions, has been contemplated; and this proposal was received last year with some favour by the Committee of the House of Lords which had the Contagious Diseases Act under consideration.* The proposal, viewed in relation to its professed aim, is of course open in the very utmost degree to the objections which I have just stated generally against permissive legislation; indeed, I can scarcely conceive that, if enacted, it would in any single case be of good effect; and there is a different point of view in which I would venture to submit that its admissibility (as well as that of any permissive legislation) requires to be most cautiously considered. For it seems to me that the proposed legislation, powerless though it would be for any sanitary result, would in principle be the thin end of a wedge; that the question of its acceptance or rejection is, as precedent, of fundamental importance; that, between permissive general legislation to-day and compulsory general legislation to-morrow, there would stand but the question of expense. In courses called tentative it is so easy to drift into positions which become pledges, that I venture to press this consideration. Whether the venereal diseases of the civil population are henceforth to be deemed matter of public concern, whether the civil fornicant may reasonably look to constituted authorities to protect him in his commerce with prostitutes, is the principle which I conceive to be at stake. And I would repeat my opinion that, if that principle is affirmed, the responsibilities implied in it cannot be adequately met without stringent compulsory general legislation.

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* I describe the financial basis of this proposal as "almost entirely" voluntary contribution. The proposal, as I understand it, is that Government should be authorized to confer the requisite police powers for sanitary superintendence of prostitution on any local authority shown to have at command (as by voluntary contribution) the proper hospital accommodation for such purposes. And the proposal seems to assume that, if lock hospitals were established by voluntary contribution, the local authority could provide (presumably from proceeds of rates) for the cost of the medical inspections and police arrangements.—J.S.

as to local Acts.

Whether particular municipalities wishing to exercise within their respective jurisdictions special powers in relation to venereal diseases might properly be let acquire such powers by purely local Acts of Parliament, is, I think, a somewhat different question; and possibly such special Acts (provided they contained proper obligatory provisions) might, in certain cases, be conceded without any sacrifice of the real principles which are at stake. Every such case would then have to be judged on its own merits. But as regards any general legislation, whether compulsory or permissive, in regard to the venereal diseases of the civil community, my conclusion is very decided that at present I cannot recommend any such legislation.

Supplementary remarks :

Finally, there are some incidental considerations to which I beg leave briefly to advert.

Prostitution, and the ways of reducing it.

Among arguments put forward to recommend a general superintendence of prostitution, there is one which seems to have gained for the proposal a considerable quantity of non-medical, particularly clerical, support. The report of the Association, namely, alleges "that a collateral but not unim-" portant result which inevitably follows the establishment " of preventive measures is the improvement in the moral and " social condition of the women;" and a memorial which was last year addressed to the then Lord President of the Council, by the President of the Royal College of Physicians and others, supported the view "that, of the unfortunate " women who are subjected to these restrictive and sanitary " measures, a comparatively large proportion have been re-" claimed." I believe it to be unquestionable that such women as have hitherto come under medical inspection have generally been influenced by it to become cleanlier in their persons, and that the brothels inspected by police are less apt than they were to be scenes of riotous disorder; changes, on which no doubt the users of those persons and places may congratulate themselves; but which cannot without extreme abuse of terms be described as of any moral significance. On the other hand, the last clause of the statement cannot

Prostitution, and the ways of reducing it.

fail to seem morally important to anyone who accepts it without reserve. I fear, however, that such hopes as it at first sight would seem to justify, as to possible moral results of a government superintendence of prostitution, would on any large scale show themselves essentially delusive; not, perhaps, as regards individual reclamations to be effected, even from brothels, by pure and kindly human contact, but as regards the statistics of prostitution, broadly and practically considered. For I apprehend that the concubinage-market, like other markets, tends to be fed according to demand; and that, if prostitution is really to be diminished, the principles of those who would diminish it must be preventive rather than reformatory. Of the many roots of the evil some are practically immutable, but others will undoubtedly vary with the general moral sentiments of the time. Always, of course, there are certain large quantities of mere brute passion, forcing at any price to have their way; and always, in our present social state, there are large unintelligent masses of human life with little sense of right and wrong, and much of abject poverty ready to sell itself for food, and even more of uneducated frivolous temperament. But if these be regarded as in my present sense "fixed" elements (though indeed all of them are happily susceptible of reduction) a comparatively very variable force is represented in the influence of public opinion. That parents of the educated classes regard with immeasurably different degrees of interest the chastity of their daughters, on the one hand, and the continence of their sons, or future sons-in-law, on the other, is a fact which probably has its basis in a doctrine of supposed general consequences; but knowledge which is supplied in studying the venereal diseases of the civil population—a knowledge of the mischief and misery which a young man's transient incontinence may be preparing for his whole future domestic life, certainly gives room for consideration whether these ingredients of the one case ought not to be more popularly understood. The only state of things which can be regarded as essentially antagonistic to prostitution is the system of early marriages: which, in this respect, commends itself equally on moral and physical grounds; for, in proportion as it is accepted, the promiscuous intercourse of the sexes ceases to excuse itself by circumstances, and the chances of venereal infection fall to the lowest level they can attain.

Hospitals for diseased prostitutes.

Also in conclusion I would beg leave (though perhaps superfluously) to protect parts of my above argument from misapprehension. In the proposals which I have had to criticise, hospitals for diseased prostitutes have not come under discussion as charitable institutions, but solely as elements in a machinery proposed to be constituted by law for giving an artificial security to promiscuous fornication. In the latter sense I may have seemed indifferent to their existence; but in the other sense, if this occasion permitted, I would willingly plead in their favour. For some thirty-five years of hospital-surgery in London have given me the amplest opportunities of knowing what physical miseries (as well as what worse mental sufferings) attach to the career of prostitutes; and in this point of view I cordially agree with those persons who deplore the extreme insufficiency of hospital accommodation provided among us for prostitutes venereally diseased. The defect may not be for legal remedy, but not the less it is real, and I sincerely hope it may be dealt with by agencies appropriate to its nature. Such are not for me here to discuss. But considering how large a proportion of society has responsibilities of causation or connivance in that sphere of suffering and shame, and considering again what case for compassion even those who are purest from such responsibilities may recognize in states of human life so estranged and so bitterly punished, I should suppose that dictates of justice on the one side, and impulses of charity on the other, would respond, and not parsimoniously, to any well-considered appeal in the matter.

QUESTION OF CONSOLIDATING AND BRINGING INTO SYSTEM THE LAWS AND ADMINISTRATIVE AGENCIES WHICH CONCERN THE PUBLIC HEALTH.

I HAVE stated that during the past year much consideration has had to be given in this department to *questions of improvement of system* in the laws and legally constituted machinery which purport to provide for the public health of the country: and it may be convenient that in this place I briefly state my experience of the present system, and my opinion of the reforms which are wanted in it.

Spirit of the present sanitary laws.

It would, I think, be difficult to over-estimate, in one most important point of view, the progress which during the last few years has been made in sanitary legislation. The principles now affirmed in our statute-book are such as, if carried into full effect, would soon reduce to quite insignificant amount our present very large proportions of preventable disease. It is the almost completely expressed intention of our law that all such states of property and all such modes of personal action or inaction as may be of danger to the public health should be brought within scope of summary procedure and prevention. Large powers have been given to local authorities, and obligation expressly imposed on them, as regards their respective districts, to suppress all kinds of nuisance, and to provide all such works and establishments as the public health primarily requires; while auxiliary powers have been given, for more or less optional exercise, in matters deemed of less than primary importance to health; as for baths and wash-houses, common lodging-houses, labourers' lodging-houses, recreation grounds, disinfection-places, hospitals, dead-houses, burial-grounds, &c. And in the interests of health the State has not only, as above, limited the freedom of persons and property in certain common respects: it has also intervened in many special relations. It has interfered between parent and child, not only in imposing limitation on industrial uses of children, but also to the extent of requiring that children shall not be left unvaccinated. It has interfered between employer and employed, to the extent of insisting, in the interests of the latter, that certain sanitary claims shall be fulfilled in all places of industrial occupation. It has interfered between vendor and purchaser; has put restrictions on the sale and purchase of poisons, has prohibited in certain cases certain commercial supplies of water, and has made it a public offence to sell adulterated food or drink or medicine, or to offer for sale any meat unfit for human food. Its care for the treatment of disease has not been unconditionally limited to treating at the public expense such sickness as may accompany destitution: it has provided that in any sort of epidemic emergency organized medical assistance, not peculiarly for paupers, may be required of local authorities; and in the same spirit it requires that vaccination at the public cost shall be given gratuitously to every claimant. The above survey might easily be extended by referring to statutes which are only of partial or indirect or subordinate interest to human health; but, such as it is, it shows beyond question that the Legislature regards the health of the people as an interest not less national than personal, and has intended to guard it with all practicable securities against trespasses, casualties, neglects and frauds.

The intentions frustrated in detail:

If, however, we turn from contemplating the intentions of the Legislature to consider the degree in which they are realized, the contrast is curiously great. Not only have permissive enactments remained for the most part unapplied in places where their application has been desirable: not only have various optional constructions and organizations which would have conduced to physical well-being, and which such enactments were designed to facilitate, remained in an immense majority of cases unbegun; but even nuisances which the law imperatively declares intolerable have, on an enormous scale, been suffered to continue; while diseases which mainly represent the inoperativeness of nuisance-law have still been occasioning, I believe, fully a fourth part of the entire mortality of the country. And when inquiry is made into the meaning of this strange unprogressiveness in reforms intended and in great part commanded by the Legislature, the explanation is not far to seek. Its essence is in the form, or perhaps I may rather say the formlessness, of the law. No doubt there are here and there other faults. But the essential fault is that laws which ought to be in the utmost possible degree simple, coherent and intelligible, are often, in nearly the utmost possible degree, complex, disjointed and obscure. Authorities and persons wishing to give them effect may often find almost insuperable difficulties in their way; and authorities and persons with contrary disposition can scarcely fail to find excuse or impunity for any amount of malfeasance or evasion.

and how?

The many mere ambiguities and minor oversights of the law need not here be insisted on; for the broad jurisdictional state of the case is in itself enough to account for miscarriage.

Local authorities: in common health-areas:

Except where special health-areas have been constituted under local Acts of Parliament, or under the Public Health and Local Government Acts, the local administration of the nuisance-law in regard of its most rudimentary objects is not vested in one single authority for each place, but is distributed, with very disputable demarcation-line, between two. And as regards the distribution of voluntary improvement-powers in such places, there may be one authority for common lodging-houses, another for labouring classes' lodging-houses, another for baths and wash-houses, another for burials; and all these authorities separate from the two authorities which have to do with nuisances and drainage and water supply, and from the authority which has to do with highways. It is true that, where special health-areas exist, matters are on a better footing as regards the consolidation of nuisance-powers and improvement-powers in the hands of the town-council, improvement commission or local board; but just in these cases a new kind of evil crops up: for, except by accidental coincidence, these special health-areas do not form units of area in the population-statistics of the country; and it consequently very often occurs that these districts (which peculiarly might be expected to be able to show an intelligible balance-sheet in regard of their expenditure of life) have really no separate statistics even of their births and deaths. Also these special health-areas have not,

in special health-areas.

except sometimes accidentally, any relation whatever to the areas of poor-law relief; and a medical officer of health acting for the health-authority of the town has no official relations with the medical attendants of the sick poor.

Central authorities.

Then (secondly) as regards central jurisdiction in nuisance-law and kindred matters, the conditions are equally unmethodical. Proceedings which stand to one another in the relation of first and second stages of legal intention are the responsibilities of two different chief ministries: on the one hand, inspectional and admonitory proceedings, such as my Lords of the Council direct through this department, in relation to local excesses of disease, and their causes; and, on the other hand, coercive proceedings, which the Secretary of State is empowered to take, in regard of defaulting nuisance-authorities: proceedings of the latter sort being hardly conceivable except on foundation of proceedings of the former sort. This of course is no insuperable difficulty; for the departments concerned can easily adjust their boundary line; but unfortunately in our sanitary code there are other and less superable wants of method. The essential responsibility for superintending the state of the public health is integrally vested in the Lords of the Council; but fragments of co-ordinate responsibility in the same subject-matter are also vested (for purposes more or less special) in the Home Secretary and in the Board of Trade; and thus one given subject-matter may be under consideration in two or even three Government offices, and each of these offices be required to communicate with the public concerning it.

Relations of Government to localities.

Thirdly, as regards the relations between central and local authorities, a very unfortunate state of things is represented in the absence of certain lines of communication. Government is supposed to supervise the state of the public health: but Government may remain for long periods of time uninformed even of extremely important local outbreaks of disease. This is constantly happening with regard to typhoid fever and other nuisance-diseases of the country; and a very suggestive illustration of the fact is, that, when dip theria was first beginning to re-appear on a large scale in this country after an interval during which the medical profession had lost all memory of it, very fatal local epidemics of what seemed a new disease were going on for two years (1855–7) in various parts of England, with the central authority of the country absolutely unapprised of the fact. In this connexion too it deserves notice, both as a matter affecting the relations of central to local jurisdictions, and indeed also as affecting the efficiency of the local authorities themselves, that, with regard to some essential elements for proper judgment as to the health of districts, the law does not even provide for the knowledge being systematically in existence. It provides, no doubt, that causes of death shall be registered; but no provision is made that the causes shall have been medically certified; and to my knowledge it has happened in regard of whole counties that, through the general absence of proper medical certificates, with the accompanying misuse of medical language by lay certifiers of death, very deceptive impressions have been given as to the local prevalence of particular diseases. A similar fault of system is shewn in the fact that no available medical returns are made of sickness locally treated at the public expense. Nor, I need hardly add, are any such returns made as to the sickness treated by our innumerable quasi-public medical charities.

Causes of the chaotic state of law.

It would be useless, though not difficult, to explain in detail how the above-described unsatisfactory state of law has come to exist. Broadly it represents two sets of causes. On the one hand, the Legislature in all these matters has evidently meant to proceed very cautiously and tentatively; and the many successive stages of attempt, while co-apparent in the statute-book, show of course a good deal of awkward piecing and overlapping, and probably more or less of accidental inconsistency, as well as a certain quantity of ground not yet covered by legislation. On the other hand, the impulses to legislation have come from many different quarters, including two or three departments of Government; and simplifications and coherency of result, such as might have been attained if all had originated from or converged to a single chief ministry for the subject-matter, are merits which, from the nature of the case, could not be expected.

Remedial legislation.

I venture to submit for consideration whether now the time has not come when a better state of things than I have described can be, and ought to be, constructed. For in regard of some very considerable parts of sanitary legislation, including the machinery by which effect is to be given to the law, the purposes of tentative proceeding have now, I apprehend, been amply fulfilled; and there exists undoubtedly a very urgent public need, that the intentions of the Legislature in the present most important subject-matter should as soon as possible, and as completely as possible, be embodied, intelligibly and harmoniously, in clear consolidating law. In contribution to this result I avail myself here of the opportunity to submit some suggestions as to what, in my opinion, are the chief objects for endeavour, and what the broad outlines of such system as might easily be attained, for sanitary government in England.

Nuisance law:

A. That the nuisance-law of England (using the word *nuisance* in its largest sanitary sense) should be put on a satisfactory footing, as regards authorities and areas of jurisdiction, seems to me the first object to be aimed at; and the opportunity would probably be found convenient for making also some extensions which are wanted as regards the scope or object-matter of the present law. Of the chief objects which I think desirable under these heads, the following is a more particular statement:—

to be consolidated with local improvement law:

(*a.*) I think it essential that the separation which recent Sewage Utilization Acts have established between nuisance-authorities and sewer-authorities should cease; that every nuisance-authority should also be sewer-authority in the fullest sense of the word; that in the hands of this consolidated health-authority should also be vested all such powers as now attach to several different authorities and corporations for purposes of local improvements and inspections in the physical interests of the people, in regard of burial grounds, baths and wash-houses, labourers' dwellings, common lodging-houses, recreation-grounds, paving, lighting, &c.

jurisdiction in special health-areas:

(*b.*) That cities and towns with developed municipal government should constitute special health-areas, having as health-authorities their respective town-councils, improvement commissioners, or other local boards, is a present state of law which of course would be continued; and the utmost facilities ought also, in my opinion, to be given (akin to those which the Local Government Act now gives) for the creation of new special health-areas, and for the variation of existing special boundaries, where required by local conditions. It seems probable that ports and harbours, with all shipping contained in them, must at least to some extent be regarded as special health-areas, having the harbour-authority for health-authority; and, if so, that, for cases where it would be convenient, the harbour-authority might be empowered to appoint some permanent officer to act as health-authority in its stead.

in ports:

in common health-areas.

(*c.*) As regards places not constituted special health-areas, choice has to be made between several courses; and the one which on the whole I think has great balance of advantages in its favour is that of consistently adhering to the intentions of Mr. Lowe's Nuisance Act of 1860, by letting the common health-areas be the union-areas of poor-law jurisdiction, and identifying the common health-authorities with the common destitution-authorities of the country. The poor-law division of the country is a long-accomplished and locally well-known division, which furnishes limits to many local relations, and, not least, fixes the Registrar-General's "districts" for statistics of population and births and deaths: every union has its administrative board, presumably of the best sort which the area can be expected to give for any purpose of local government, and carefully constituted on the double basis of rate-paying suffrage and ex-officio qualification, and moreover so constituted that each parish of the union is represented in it: and this authority has its fixed meeting-place and meeting-times: it has its permanent clerk, qualified in law: and it has, always acting in detail over the whole union-area, as visitors of the poor and their dwellings, a staff of other permanent officers, medical and non-medical. No approach to such organization as this exists for any other purpose in the rural districts of the country; and it would seem to me a simpler and safer course to bring the common health-service of the country within scope of that existing organization than to attempt a differently planned organization for objects exclusively of health. Among plans which may be conceived as alternatives to the above, it might be proposed to revert to some such parochial system as that of Sir Benjamin Hall's Nuisance Act of 1855, or to develop the parochial system of Sir George Grey's Sewage Utilization Act of 1865; but any parochial system, if not to be utterly abortive, would have to provide for the constitution of boards and offices for each parish with an elaborateness which would often seem most disproportionate; and the result when obtained would be a jurisdictional system conterminous with little except the system of church-rates. Other sorts of plan might aim at establishing a system of county-boards, with some sub-scheme, perhaps of descending scale, for smaller (say, at last parochial) sub-jurisdictions; but here again the law would fail, unless it provided for the boards and officers of the sub-jurisdictions; and all this apparatus, because of its novelty, would have to be planned so minutely, as compared with the actual work to be done in each rural sub-jurisdiction, that it could scarcely not seem excessive and pedantic. And in any of these alternative plans there would be difficulty in avoiding what, if it occurred, would be matter for extreme regret, an entire dissociation of the local health-machinery from that universal system of medical attendance which exists for purposes of the poor-law.

Relation of health-authority to authority for destitution: in common health-areas:

(*d.*) If, however, the common health-areas of the country are to be the areas of poor-law unions, and the local authorities acting for destitution are to be the local authorities acting for health, there are three conditions which I think ought to be observed. First, regard being had to the great extent of most rural unions, and to various other considerations, it is peculiarly necessary that the authority should be well empowered to act through committees, both for divisions of district and for divisions of subject-matter; and probably it would be convenient that such committees should be able to include persons not members of the original board.

Secondly, regard being had to the frequency with which neighbouring districts have joint interest in questions, as particularly of drainage and the like, each authority ought to have facilities, and in certain cases obligation, to combine for particular purposes, by committee or in entirety, with other neighbouring authorities. Thirdly, I think it scarcely less than essential that any law which connects for local administration the two services of health and poor-law relief should do so in a different form to that of the law now in force. At present in all common health-areas of the country the board of guardians of the poor is the nuisance-authority; but it is so *ex-officio*; and this peculiar form of law not only gives to the health-interests of the place an undue appearance of being of secondary importance, but also sometimes leads the guardians to think themselves surcharged with duties foreign to their real business. It seems to me highly desirable that, if the two administrations are to be associated, the board should be appointed, *ab initio*, expressly for the compound purpose, and should be invested by law with a new title denoting its double functions as authority for health and destitution.

in special health-areas.

(*e.*) Within almost all special health-areas of the country the health-authority is, and I must assume will for the present continue to be, distinct from the destitution-authority of the place. I accept this as fact, but I doubt if it is to be deemed an advantage. I suspect it would generally be of benefit to municipal administration if one single board, with sufficient power of acting by committee, were elected for all purposes of local government, including the relief of destitution.

Local medical services under health-law.

(*f.*) As regards certain medical services to be locally rendered in aid of health-authorities as such, I think, first, that every health-authority should be empowered to appoint a special health-officer; secondly, that wherever there is a special health-area the appointment of a special health-officer should be imperative; thirdly, that for areas where the destitution-authority is also the health-authority, the rule ought to be that, if no special health-officer is appointed, each medical officer acting under the destitution-authority should [for certain purposes] be deemed health-officer within the limits of his own medical relief district.* I think it indispensable that everywhere throughout the country there should be an officer to whom the local authorities and the public may look for those definite occasional acts of inspection and certification which an amended health-law would certainly require from time to time to be executed, and to some of which I shall hereafter refer; but it is obvious that in many of the common health-areas of the country occasions for this sort of action would be so few that probably the services might best be paid by fees. In all important special health-areas, on the other hand, the services would be more or less continuous; but it could only be in some very few cases that the duties of the health-officer in a single health-area would represent entire occupation of his time; and therefore, for other cases, it seems to me greatly to be desired, with a view to procuring proper cultivation of the required medical accomplishments, that the special health-officer of one town should be free to be special health-officer to another; and that the two parties concerned should so avail themselves of this freedom that the special health-officer might be able to dispense with ordinary professional practice, and that the towns employing him might be able to secure a very high quality of special service.

Local medical services under health-law.

(*g.*) The system of summary procedure which is the essence of our modern nuisance-law (subject, of course, in certain cases to appeal to a superior court) ought in my opinion to be extended as far as practicable to all influences by which the public health is endangered, and the word "nuisance" for the purposes of the law to be applied to every such influence. Especially, it seems to me, that all such pollutions and obstructions of streams as may be of ill consequence to the public health ought to fall within the law of nuisance.

Extension of legal definition of "nuisance."

(*h.*) With regard to all such sorts of nuisance as are likely to be recurrent or habitual, the central authority, and with

Regulation against recurrent nuisances.

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* For brevity, I use the word "health-officer" without qualification: but I may observe that the functions for which I am here proposing to provide universally are only such few rudimentary functions as to attach to a minor health-officer, and that the question of superintendent health-officers, acting for counties or any other large areas, is one on which I do not at present enter.—J.S.

its consent local authorities, ought, I think, to be able to make regulations and to affix penalty to breaches of them.

Proceedings.

(*i.*) All proceedings under the nuisance-law might, I believe, with advantage be open indifferently to any person aggrieved, and to the local authority, and to the central authority.

Other conterminous medical responsibilities:

B. Two very important medical responsibilities, not arising under the nuisance-law, nor under the poor-law, but created by special Acts of Parliament, have at present to be discharged, the one entirely, and the other almost entirely, by the respective destitution-authorities of unions and parishes, viz., first, public vaccination, and, secondly, medical relief in epidemic emergencies.

public vaccination:

(*a.*) The authority for public vaccination is now universally the destitution-authority, which in all common health-areas is identical with the nuisance-authority, but in all special health-areas is separate from it. Under the system I am suggesting, public vaccination in the common health-areas would remain substantially unchanged ; it would be one of the health-functions of the double-functioned local authority ; but as regards special health-areas, it would certainly admit of question whether public vaccination ought not rather to be a function of the consolidated health-authority than a function of the authority for destitution; and I am myself disposed to think that in those areas the transfer would generally be desirable.

action under Diseases Prevention Act.

(*b.*) Exceptional medical relief in epidemic emergencies (as requirable under the Diseases Prevention Act) is so essentially a mere temporary increase of the ordinary medical relief of the poor, that I think it ought always to be a function of the authority which administers the ordinary relief. Thus, under present poor-law, the function would everywhere attach to the destitution-authority of the place. With regard to special health-areas, where almost universally the destitution-authority and health-authority are mutually independent bodies, the law ought to take security for all necessary co-operation of the two sets of officers ; and this not only when the Diseases Prevention Act is in operation, but equally as to all ordinary relations between the preventive and the curative jurisdictions.

Local medical functions attributable over larger areas.

C. Beyond the purview of such laws as I have yet spoken of, very important sanitary objects yet remain to be provided for by some sort of local administration. Such are the protection of the public against sale of adulterated and damaged food, and against malpractices of water-companies, and against offences under the Pharmacy Act; proceedings as to the diseases, especially the contagious diseases, of domestic animals; provision of skilled assistance to local magistrates when crimes against life are imputed, &c. As regards all these matters, some distinctive principles are involved, making it in my opinion for various reasons inexpedient that here the local authorities should be such as have hitherto been under consideration. One immensely important group of functions under the present head is to protect the public health against various kinds of commercial wrong; and if powers for this purpose are to be strongly and impartially exercised, it would seem desirable, first, that the areas of jurisdiction should be as large as conveniently may be, and then that the empowered authorities should rather be of magisterial type than consist of boards constituted by annual popular election. Probably the magistracy of boroughs and counties, as represented in courts of quarter-session, would be the best local authority in the matter; and it might, I submit, be required of each of these courts to appoint a public analyst, with definite duties under the adulteration laws, and with reference to public supplies of water, and various like matters. It seems to me that, for all health-matters not in the hands of nuisance-authorities or destitution-authorities, an uniform constitution of authority on this magisterial basis might very conveniently be provided; bringing more or less completely into one system the local supervision of branches of trade which concern life, and the local supervision of cattle diseases, and the local supervision of lunatic asylums, and local arrangements for providing skilled evidence in aid of coroners' inquests.

On the present occasion my subject-matter consists so especially of questions of method and organization, that I must here pass without mention many points where the law seems to me in other respects to require amendment; but I may observe in passing, that many of the most important objects which I propose should be matters of quarter-sessions' authority are hitherto very imperfectly provided for by law.

Central authority in regard of regulations and sanctions.

D. For certain cases where public health is in question, the central authority is authorized by law to issue orders and regulations which, when issued, have the force of law in relation to the local authorities addressed. And in certain other cases the right of local authorities to take particular courses of action is by law made contingent on the central authority's giving approval to such courses. What ought to be the precise extent of the discretional control to be thus exercised by central authority in local affairs is not a question which needs here be discussed; but the number of cases which statute-law cannot touch in exact terms is so great, that manifestly, if such law is to work with promptitude and ease, it must, to a greater or less extent, be supplemented by that elastic margin of what may be called law in reserve.

Ordinary relations between central and local authorities.

E. The ordinary administrative relations which the law supposes to exist between local authorities and central authority in relation to the public health are in substance two:

first, that the central authority watches the fluctuations of health in all the health-areas of the country respectively;

and, secondly, that, discovering from indications thus supplied the cases where health-law is not properly administered, it takes steps, which in the last resort may be coercive of local authorities, to procure proper obedience to the law.

The extent to which the law imposes definite obligations on local authorities assigns of course a limit to the central authority as regards the class of cases where its coercive interference is possible; but far beyond that limit, as well as also within it, innumerable cases present themselves, where mere information and advice from the central authority may be influences of the utmost value in determining local authorities to right measures for the public health. It is manifest that functions of this sort cannot be exercised by any central authority except in proportion as it is cognizant of local variations in the public health: proper provisions for making all such variations known to the central authority are therefore elementary necessities in that mixed system of central and local government which the law has intended to operate for sanitary purposes in England: and greatly to improve the provisions which now exist in this country for recording and reporting the deaths and sickness of the community, is, in my opinion, an object of quite fundamental importance among such improvements of method as I am considering. The chief points where I think amendment wanted for purposes of general administration are as follows:

Knowledge of deaths to be made available:

(*a.*) With regard to the knowledge which ought to be had concerning the deaths of the population, I have three suggestions to make.

medical certificates:

First, in my opinion, the law ought as far as practicable to require in every case of death that the cause of the death be medically certified. Exception, not in substance but in form, might have to be made for cases where coroners' inquests are held; *i.e.*, the verdict of any such inquest must of course be understood to include the substance of any required medical certificate. And possibly, for very exceptional circumstances, it might be desirable to provide that, in them, any magistrate's order should exonerate from the necessity of the certificate. But, subject only to such qualifications as these, it seems to me that in all cases of death a medical certificate of the cause of death ought to be required; a certificate to be obtained, where practicable, from the medical practitioner who attended the fatal illness; or, where there has been no medical attendant, or none from whom a certificate can be obtained, from the public health-officer of the district.

local distribution:

Secondly, I think it essential that the division of the country for purposes of census and registration of births and deaths should, as far as practicable, treat as separate districts or sub-districts all areas which are separately identified for purposes of health administration. New special health-areas are constantly in course of formation under the Local Government Act, and perhaps otherwise;

and I would suggest that, as soon as possible after the formation of any such special health-district, it should be created a district or sub-district for purposes of registration and census.

statistical returns.

Thirdly, I refer with admiration to the detailed numerical statement which the Registrar General issues every Tuesday on the subject of the deaths of the metropolis during the last preceding week: a statement which relates to three millions of population occupying 137 separate sub-districts, and which not only gives the gross number of deaths for each sub-district respectively, but distinguishes also for each sub-district the more important causes of death; so that persons interested in the health-administration of London are able at a glance to see, with considerable minuteness, in what parts of London each of the principal zymotic diseases has been fatal during the previous week, and what number of deaths in each sub-district each such disease has produced. If what is thus done every week for about a seventh part of the population of England could be done for the whole population, not every week, but every quarter, this quarterly publication would represent one of the most important aids which could be rendered to the health-administration of the country. The present quarterly returns of the Registrar General state what gross number of deaths has occurred in each registration-district of the country; and a few of the sub-district registrars comply with a request which the Registrar General has during some years past made to all of them for "notes" on the prevalence of particular diseases in their sub-districts. But not even an approximative opinion as to the distribution of disease in the country can be formed from these imperfect and uncertain materials; and it is not till nearly two years later that the detailed results of the registration of deaths can be gathered from the annual reports of the Registrar General. A system of quarterly death-reports for the entire country, in general conformity with the weekly death-reports which are given for London, is therefore among the amendments for which I hope.

Knowledge of sickness to be made available.

(*b.*) With regard to the knowledge which ought to be had concerning the sickness of the population, I think that, greatly

Knowledge of sickness to be made available.

for immediate purposes of medical science and health-administration, and in an even higher degree for common purposes of public economy, certain broad information ought periodically to be given as to the quantities and kinds of sickness treated by the several destitution-authorities and by the several medical charities of the country. As regards the former, it would seem desirable that at fixed intervals (say quarterly) each destitution-authority should state in a fixed tabular form, for each of its medical relief districts, what numbers of cases of disease generally, and of a few of the more important epidemic diseases individually, had been remaining under treatment at the commencement of the period; and what numbers had been remaining at the end; and what numbers of new cases had come under treatment during the period; and what number of deaths had occurred among new cases and old cases respectively. And as regards medical charities, I venture to suggest that, in the rightly understood interests of their subscribers, no less than for other ends to which I have referred, a system of uniform registration, and an uniform contribution of annual returns, ought to be claimable from them by the central authority, in reference to the sexes, ages, numbers, and kinds of cases treated by them respectively, and to the duration and results of treatment.

Central authority.

F. That any central offices which have to do with sanitary affairs ought, like the local authorities and jurisdictions, to be methodically related to each other and to the public, on some simple consistent plan, according to their respective subject-matters, is of course indisputable: but this section of the argument does not here require at my hands more than a few explanatory remarks. If the present central offices which are more or less concerned in the question be regarded according to their main intentions, and therefore without reference to such minor flaws and uncertainties of jurisdiction as any consolidated law would at once rectify, the following may be taken as their scheme.

Functions of the Lords of the Council.

(*a*.) The functions which my Lords of the Privy Council exercise through their Medical Officer, and for which the Medical Department of the Council Office is constituted under

Functions of the Lords of the Council.

the Public Health Act, 1858, are the essentially sanitary functions of Government: such as the following:

to take practical cognizance of all important faults and fluctuations of the public health, general or local; looking at each such fault or fluctuation as a question of cause and effect, and examining for the common interests whether in each suffering or endangered place everything is done which ought to be done in prevention of the beginnings or spreadings of disease; and thus and from other points of view to act in supervision of all local health-authorities as such, and to give them such advice or to adopt such other measures as the circumstances in each case may shew necessary;

to provide an office of reference and appeal for local authorities and for the people generally on all considerable sanitary influences operating in the country, and on all other public questions of causation and prevention of disease, so far as the knowledge of the time enables such questions to be answered, an office in which scientific knowledge of this sort shall be systematically gathered and reported for public use, and in which, so far as practicable, such knowledge shall be increased from year to year by special scientific investigations;

to issue, and afterwards to superintend in operation, such orders, regulations and sanctions, as the Government with medical advice sees fit, in relation to various special matters which the Legislature has made subject to this control: as local provision against epidemics, performance of public vaccination, questions as to practice of pharmacy and sale of poisons, questions as to the medical profession, &c.

Offices connected with Medical Department of Privy Council.

(*b.*) There are two offices which, by a part of their subject-matter, have close, though not extensive, relation to the Medical Department of the Council Office; two offices, namely, which both are under direction of Her Majesty's Home Secretary of State. On the one hand there is the great arithmetical office, over which the Registrar-General presides: the office to which the public looks for all numerical information obtained by periodical census and from local registers, as to the numbers, ages, sexes, birth-places, industries, and family-combinations of the people, and as to the marriages, births

Offices connected with Medical Department of Privy Council.

and deaths, which take place amongst them: and I need hardly observe that one part of this statistical information constitutes an indispensable basis for some proceedings in the Medical Department. On the other hand, there is the office through which the Secretary of State, under authority of the Local Government Act, controls the exercise of rating and borrowing powers for purposes of local improvement under the Act, and, incidentally to this control, has before him for skilled criticism the various proposals of local authorities for drainage, sewage-utilization, &c. And as this office (essentially including a staff of engineers) has been found the most convenient machinery through which the Secretary of State can advise, and in case of need enforce, in regard of localities, certain constructional improvements which may be needful for the health of the inhabitants, so, in the particular cases where necessities of this sort are in question, the action of Government may be considered as consisting of two stages: the first conducted in this department of the Council Office, and the second conducted in the local improvement office of the Home Secretary. This department then, which is essentially medical, has an important point of contact with each of those two non-medical offices: but the three subject-matters, in their main extent, are necessarily separate for administration. Whether the three offices ought still to remain as now divided under two chief ministers, or might more conveniently be all made subject to one, and, if so, to which one, are questions which of course involve many other considerations than those on which it is my province to enter. I am however permitted to state that these questions, with others relating to the distribution of central sanitary work, are at present being considered by the Ministers whose departments they specially concern.

From the Twelfth Report to the Privy Council, 1869.

[The Twelfth Report comprises sections relating to the Special Diseases of the Year; Nuisances Removal and Water Supply; Public Vaccination, which has appeared in Vol. I., pp. 374–93; Papers relating to the Constitution of the Medical Profession (transferred in the reprint to the section devoted to that subject, Vol. I., pp. 508–18); The Practice of Pharmacy (also for convenience transferred to Vol. I., pp. 551–3); Scientific Investigations in aid of the practical work of the Department.—Ed.]

THE SPECIAL DISEASES OF 1869.

1. *Relapsing Fever.*

Relapsing Fever.

A very exceptional fact concerning the health of England in 1869 was that we were under evident re-visitation by *Relapsing Fever*, a disease generally almost unknown in England, but which during the later months of 1869 acquired considerable prevalence in London. From as far back as the middle of 1868 occasional facts had been suggesting that London was not unlikely to suffer from such an epidemic; and a curiously local but severe epidemic of the disease is stated to have prevailed within this time among the iron-mining population of Tredegar, in Monmouthshire. Towards the autumn of 1869 decided threatenings of danger to London came to light in the practice of the London Fever Hospital, and, as they increased, soon led Dr. Murchison, physician of that useful charity, to draw professional attention to them by a letter (dated October 9th) in one of the medical journals. My Lords, having Dr. Murchison's facts before them, and seeing their very serious importance in relation to the health of the metropolis, thought it right immediately to bring them under the particular notice of the Poor Law Board and of the metropolitan Officers of Health, with a view to ensure, as far as possible, that, while there was yet time, proper precautions against the danger should be taken; and one of the inspectors of this department (Dr. Buchanan) was specially charged with the duty of reporting on the progress of the disease in the

Relapsing fever.

different districts of London, and of personally communicating with local authorities and officers where the disease was spreading. Somewhat later, the disease being evidently on the increase, and the circumstances having become more urgent, my Lords addressed a circular letter to all the boards and vestries of the metropolis, drawing their attention to the powers conferred on them by the sections of the Sanitary Act, 1866, which have reference to infectious disease; and their Lordships continued in communication with the Poor Law Board (who on their side were communicating with the local destitution-authorities of London) as to the action which, in the circumstances, had to be taken under the poor law. Extracts (which I subjoin [A]) from an office memorandum written on the 22nd October, and then communicated to the Poor Law Board, may serve to show what, down to that date, had been the early steps of the epidemic in London; and the following extracts from a later issue of the same memorandum, when circulated among the local authorities of London, briefly explains the nature of the claims which those authorities were now called upon to meet.

"For local authorities, having to treat the disease or to take precautions against it, the chief practical points to be borne in view are the following.

"i. The greatest personal predisposition to Relapsing Fever is given by states of poverty and privation: so much so, that the disease is often known by the name of 'famine-fever.' Where destitution has not existed, or has been adequately relieved, relapsing fever is not likely to be epidemic.

"ii. Relapsing fever is in a very high degree communicable from sick to healthy. The more confined the atmosphere in which sick and healthy are together, the more certain is the disease to be communicated.

"iii. An attack of relapsing fever is greatly less dangerous to life than an attack of typhus. But where relapsing fever has attacked, and when all its acute symptoms are past, the sufferers remain for a while extremely weak, requiring that food and restoratives should be liberally supplied them; in default of which, the feebleness left by the disease may often

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be of indefinite duration. This is the more important, because, where relapsing fever becomes epidemic, typhus often accompanies or follows it; and persons whom the relapsing fever has weakened, not unfrequently fall victims of typhus.

"iv. Relapsing fever is eminently a disease which cannot safely be treated in the houses of the poor; for in them, crowded and ill-ventilated as they generally are, and with inmates often insufficiently nourished, there must be every likelihood that the infection will spread. It is essential that, under such circumstances, the sick should at once be removed from amid the healthy. Ample hospital-accommodation is therefore an indispensable condition for limiting the extension of the disease.

"v. Of duties which have to be discharged by local authorities in the several parts of London in relation to the present subject-matter, some are duties of poor law relief, and others are duties of general sanitary administration; but as the former are done under direction of the Poor Law Board, only the latter are here adverted to. At present (as in all times when epidemic disease is prevalent or threatening) it is particularly important that powers conferred by the Nuisances Removal and other General Sanitary Acts should be well exercised by those in whom they are vested. Very detailed district inspection is most necessary. Everything practicable should be done, especially in all poorer parts of each district, to promote cleanliness of and about dwellings. The washing and lime-whiting of uncleanly premises, especially of such as are densely occupied, should be pressed with all practicable despatch. It is essential that over-crowding should, as far as possible, be prevented, and proper ventilation be enforced; and in these respects common lodging-houses, and houses which are sublet in several small holdings, will require particular attention. Above all, the attention of nuisance authorities is invited to the powers conferred on them by various sections of the Sanitary Act, 1866, with reference to infectious disease; especially to the powers conferred for purposes of disinfection, and for the conveyance of sick persons, and for the separation of the sick from the healthy.

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"vi. It is essential for the local authorities of London to know that at the present time the London Fever Hospital is full; that henceforth neither it nor any of the general hospitals of London can be looked to as capable of giving assistance in any degree adequate to the probable growth of the epidemic; and, consequently, that districts where the disease exists will be very seriously endangered if special hospital accommodation for their sick be not at once provided."

In the emergency which the foregoing statements represent, and which (as the last paragraphs may particularly suggest) implied some most formidable possibilities for the poorer population of London, a good fortune which could not be too highly appreciated was, that, under the amended Metropolitan Poor Law, the all-important business of providing proper hospital-accommodation for the sick did not need to be done in fragments by a number of mutually independent small authorities, but could be worthily dealt with as a whole by the Metropolitan Asylums Board. The representations which my Lords had addressed to the Poor Law Board on the pressing exigencies of the case, led to vigorous action being taken by the Asylums Board; and in consequence of this, partly through the facilities which it gave to the infected parts of London for eliminating their infected sick, and partly through the pains which local authorities were induced to take to turn those facilities to proper account, a very real check, which gradually became more and more effective, was given to the progress of the epidemic. In November, as a first step, the accommodation of the London Fever Hospital was increased, at the expense of the Metropolitan Asylums Board, by the erection of an iron building containing 64 beds; and the Asylums Board commenced in December, on its own ground at Hampstead, the construction of another fever hospital, which was opened at the end of January, with capacity for 90 patients.

The admissions of relapsing fever into the London Fever Hospital in October had numbered 130; in November they were 259; in December 315. Here, perhaps, strictly speaking, my statements on the subject ought to cease, as my report

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formally relates only to the business of 1869; but probably I shall be excused for adding the more satisfactory experience of the first three months of 1870. After Christmas the disease increased in the district of Holborn with Clerkenwell, and in the parish of St. Saviour's, Southwark, and appears to have attained at the beginning of the new year its chief extension over the poorer parts of London. In January the cases of relapsing fever admitted into the London Fever Hospital were 258: in February the London Fever Hospital together with the newly opened Hampstead Hospital received 153 cases only: in March they received 140. At the present date (March 31st, 1870) the two hospitals contain 103 cases of relapsing fever; the disease is on the wane; and the months of winter, during which such infections are particularly apt to spread among the poor, have happily now passed with comparatively a trifling epidemic. The districts which recently have supplied most cases have continued to be Whitechapel, St. Giles's, and Camberwell.

I have to add that, in the earlier periods of the epidemic, when the London Fever Hospital was proving insufficient for the emergency, the London Hospital in Whitechapel devoted a ward to the reception of cases of relapsing fever, and treated in all, during the three or four months, 65 cases of the disease. Otherwise, the general hospitals of London have done nothing, or next to nothing, in the matter. Of course a number of cases, perhaps a considerable number, has been treated in the dwellings of the poor; but every endeavour has been made, and it is hoped with fair success, to make this dangerous plan of treatment exceptional.

The mortality from the fever has, as usual, been very low. Of 769 cases treated in the London Fever Hospital in 1869 (among whom men exceeded women in the proportion of 474 to 295) only 17 cases were fatal; and these few deaths occurred chiefly among persons previously weakened by age or disease.

At the present date it would be premature, even as regards London, to speak of the visitation of relapsing fever in a purely retrospective sense. For the infection still exists among us in more than sufficient quantity to constitute a very

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formidable danger to the public health if circumstances were such as to favour its spread. So far, however, as we know the circumstances which might tend to that grievous result at present are not, nor for some months are likely to be, in any such relative excess as to promote a great extension of the disease. Meanwhile it is satisfactory to note that though cases of the fever have occurred and are still occurring in other great towns of the United Kingdom, in them, generally speaking, the disease has not hitherto been at all abundant; and we may fairly hope that before winter returns the infection of relapsing fever will have become again extinct in places which at present are retaining it.

The Diseases Prevention Act.

I ought not to close this section of my report without adverting to the negative fact, that although during 1869 the public health was seriously endangered by the above-described visitation of relapsing fever in London, and although a special statute, the so-called "Diseases "Prevention Act," has been provided by the Legislature, to be put in force by the Lords of the Council, at their discretion, "whenever any part of England appears "to be threatened with or is affected by any formidable "epidemic, endemic, or contagious disease," my Lords in 1869 did not see fit to put the Diseases Prevention Act in force. Had the Act been put in force in London, it would have added almost nothing of any real practical value to powers and sanctions otherwise existing; while, far outweighing any little good it might so have promoted, it would have detached the provision of hospital accommodation from the general poor-law provision of medical relief, would in the former most important respect have substituted a very uncertain for a comparatively sure machinery, and might not improbably have done the enormous mischief of perplexing an urgent crisis with wrangles of ambiguous jurisdiction. For, as matters stood, the duty of providing adequate hospital accommodation for destitute infected persons—and, broadly speaking, all the infected were destitute—was, without any manner of doubt, an obligation on the poor-law authorities; an obligation intimately akin to the ordinary relief duties

The Diseases Prevention Act.

of those authorities; an obligation too, which, under recent amendments of poor law, those authorities (as I have already explained) had peculiar facilities for successfully discharging in regard of the metropolis as a whole. On the other hand, if the Diseases Prevention Act had been put in force in London, these advantages must have been sacrificed. The local authorities for the purposes of the Act, including all requisite hospital accommodation for the sick, would have been the vestries and district boards of the metropolis; bodies not ordinarily exercising other functions of medical relief, and therefore likely to exercise the required function under some considerable disadvantages; bodies, moreover, not so related to one another that anything like concerted action for the metropolis as a whole could within any reasonable time have been expected from them. Further, if the ripe intentions of the legislature with regard to the incidence of taxation for the relief of destitute sickness in the metropolis may be gathered from the provisions of the Metropolitan Asylums Act of 1867, rather than from those of the Diseases Prevention Act of 1855, only very strong reasons could have justified the Lords of the Council in having recourse to the latter Act; under which, so far as it could be of effect, the cost of providing hospital accommodation in the poorest districts of London, where likely to be almost exclusively needed, would have had to be borne as a separate very onerous charge in each such district for itself, instead of being (as under the Metropolitan Asylums Act it was) a very slight additional charge on the metropolis, considered as a whole. And moreover the legal difficulty was felt, which any poorer district unwilling to accept the above charge might at its option have raised, that, notwithstanding the enforcement of the Diseases Prevention Act, the Metropolitan Asylums Board would retain its full previous responsibility to provide hospital accommodation for the destitute classes of London.

The above considerations will no doubt sufficiently explain why my Lords in 1869 left the Diseases Prevention Act unapplied. And the representations which my last year's report contained, on the chaotic state of English law in relation to sanitary government, certainly received a striking comment, The Diseases Prevention Act.

when the statute which purports to provide for emergencies of epidemic disease, a statute not yet fifteen years old, had in an important crisis to be treated as virtually obsolete, because its enforcement would have confused instead of simplifying, and have weakened instead of strengthening, the machinery which it is imagined to make more effective.

2. *Scarlatina.*

Scarlatina.

The year 1869 was marked by a very extensive and fatal prevalence of *Scarlatina* in England. The total number of deaths which were thus produced in England, and the local distribution of those deaths in the country, will not be known till the time (probably about the middle of 1871) when the Registrar-General can publish his compilation from the local registers of 1869; but that throughout the year a very widespread and destructive epidemic of scarlatina was prevailing, was made evident not only by the general alarmed outcry of the public, but, as regards some places, by detailed statistical information. Particularly as regards London, the arithmetical details were published week by week by the Registrar-General, and they, during great part of the year, were certainly enough to excite alarm; for the weekly number of scarlatina deaths in London, which for the first half of the year had averaged but about 50, began after Midsummer rapidly to increase, soon passed 100, were above 200 before the end of September, thence till the middle of December kept the very high average of 220, and by the end of the year had taken in London altogether as many as 5,803 lives. In the two years 1863–4, scarlatina destroyed in England more than 60,000 persons; and so far as comparison can yet be formed between that and the present epidemic, it seems probable that the present epidemic is of at least equal severity. The existence of so great an epidemic seemed a proper occasion for this department to circulate such advice as it was able to give to the public on the precautions which could be taken against scarlatina; and with this view, under their Lordships' authority, I prepared and extensively circulated the subjoined memorandum. See below, page 393.

Scarlatina.

At the present time, with scientific knowledge limited as it is, and with our very imperfect administrative resources, anyone who is responsible for advising on the requirements of the public health must feel extreme difficulty, and indeed almost humiliation, in having to advise about Scarlatina. The disease is eminently one which we should wish to prevent; for, so far as it is unprevented, not even the best medical skill can always, or nearly always, cure it; and thus year by year it kills thousands of us in England, besides inflicting enormous suffering (not infrequently with permanent injury) on many other thousands whom it attacks but does not kill. Yet, as knowledge and administrative resources now stand, official powers of preventing this murderous disease are, practically speaking, insignificant; and such general advice as may be given for individual preventive purposes has so little likelihood of being applied except in select cases, that, as regards the main mass of sufferers, it may seem almost insincere and derisory. Scarlatina is profusely, and to a certain extent uncontrollably, contagious: uncontrollably, in so far as science cannot yet offer against it any such personal protection as vaccination confers against small-pox; uncontrollably again, in so far as, in order to spread, it does not, like typhoid fever and cholera, depend or mainly depend on conditions which moderate sanitary care removes; uncontrollably further, in so far as its contagium is of most persistent activity, and remains in force for indefinite periods of time in clothing, bed-furniture, and other objects which give it a resting place. Of this subtle and destructive contagium we know no other birthplace than the human body. We know that persons who themselves are under its influence evolve it in enormous quantities; but by what process of formation in the human body, or from what source in external nature, it had its first rise, and can apparently still from time to time have new beginnings or multiplications, is far beyond our positive knowledge. Thus, at present, *we have not any other known power of dealing preventively with the disease than such as consists in intercepting all contagious communication between the infected and the non-infected parts of the population.* Thoroughly to isolate the sick from

Scarlatina.

intercourse with susceptible persons, and thoroughly to trap and exterminate all contagium which the bodies of the sick evolve, are the preventive feats which have to be accomplished. The difficulties of the task are extreme. Often they are not successfully encountered, even in wealthy and well-ordered establishments, with every material and educational advantage; and no one who is conversant with the domestic circumstances and habits of the great masses of our population can expect that among these millions, particularly in the poorer and more crowded dwellings of the labouring classes, the spreading of scarlatina will be very effectively resisted by such measures as alone are yet available.

It seems to me immensely important, not only with reference to scarlatina, but generally with reference to all dangerous communicable diseases, that the public should clearly understand what are, and what are not, the possibilities and the hopes of preventive medicine. These may be indicated under two heads.

In the first place, taking scientific knowledge as it now stands, scarlatina cannot be effectually resisted except in proportion as the public is prepared to enforce a thoroughly strict system of isolation-rules against infected persons, and infected houses, and infected furniture, and infected clothing. That such rules in their utmost strictness would be very onerous, can of course not be denied; but even by measures short of extreme strictness our present immense amount of injury might be greatly lessened; and it surely is not unreasonable to demand for human life in this respect some of the same sort of administrative efficiency as the money-interests of cattle-keepers have received. If scarlatina and the like diseases are to be stopped, first let certain local facilities for dealing properly with dangerous infective diseases be claimable within every health-jurisdiction of the country —facilities which are hitherto almost universally non-existent among us; and then let the authority of every such jurisdiction be by law required to take definite precautionary means against the diffusion of such diseases. It would be needful, and for the purpose in view would require to be made a legal obligation, that every health-authority of the

Scarlatina.

country should have sufficient proper and permanent hospital-accommodation for cases of infective disease arising within the jurisdiction, and should have all disinfectant processes necessary for protection of the public health done under direction of a skilled officer, and as far as necessary at a public establishment and at the public cost, and should take the initiative in enforcing, as regards sick persons and dead bodies and infected things, such several rules of conduct as universal experience dictates, to prevent the wanton spreading of disease. Doubtless such rules would interfere with certain hitherto permitted freedoms: that children should at their parents' discretion carry infection from families into schools, that schoolmasters should at their discretion disperse infected children haphazard about the country, that householders should at their discretion send infected wash-things to common laundries, that lodging-house keepers should at their discretion conceal the infectedness of their apartments, that all sorts of people in all sorts of ways should at their discretion endanger others: but I apprehend that, in the present state of our knowledge, freedoms such as the above can in practice only mean an unlimited acceptance of disease; for to imagine that, while such freedoms are allowed, extremely contagious diseases will spontaneously cease, is an absurdity which when the cattle-plague was in question no average cowkeeper entertained.

In the second place, though at present any more radical resistance to these dreadful infections is not within the resources of preventive medicine, hopes may fairly be entertained that in time such other resistance will become possible; that, in proportion as exact scientific knowledge penetrates more deeply into the mode of generation of these contagia, preventive or counteractive means, hitherto unimagined, will be added to our resources against them. I cannot express in adequate terms how very great an importance ought in my opinion to be attached to the sorts of scientific research by which such results may be realized. Considering on the one hand what Jenner's discovery in relation to one such disease has done for the whole human race: what addition to collective human strength it represents, and what mitigation of human suffering: and considering on the other hand the immeasurable ravages of the remaining unconquered contagia; I cannot conceive any scientific problems worthy even to be compared in importance with such as are here referred to. Studies more or less tending to solve these problems are fortunately now being followed with due zeal and intelligence by various foreign observers; and in this country (as will be more particularly seen in later parts of the present report) my Lords of the Council have accepted, as among the responsibilities of their medical department, to take such active share in that scientific work as Parliament may be willing to sanction, and as other claims on the department will allow. Necessarily, however, in genuine science the progress of most discovery is slow; and the nature of the present subject-matter is such that, except in so far as accident may happen to assist us, the work may have lasted for years before it essentially alters the practical aspects of the case. Therefore, though I here mention these studies as justifying in my opinion very sanguine hopes as to the eventual preventability of zymotic disease, provisionally I must count them as almost nothing. And in this sense, taking scientific knowledge as it now stands, scarlatina, I repeat, cannot be effectually limited except in proportion as the public is prepared to enforce thoroughly strict isolation-rules against it. Scarlatina.

APPENDIX.

PRECAUTIONS to be taken against SCARLATINA.

Precautions against scarlatina.

In every case where scarlatina prevails or threatens to prevail in a district (as, indeed, wherever there is prevalence or threatening of any other epidemic disease) it is of more than common importance that, both by private action and by action of local authorities, everything practicable should be done to ensure freshness of atmosphere and dryness of soil and entire absence of dirt throughout the district, especially in and about houses, and to guard against overcrowding of inhabitants, and to provide that impure water be not drunk. It is of course particularly necessary that such district-inspections as are ordered by section 20 of the "Sanitary Act, 1866," should be frequently and carefully made by the nuisance-authority, and that whatever proceedings are required to procure the abatement of nuisances should be pressed with all practicable despatch.

Local authorities and the public ought also to bear well in mind the contagiousness of scarlatina, and the precautions which that property of the disease

Precautions against scarlatina.

renders necessary. Each patient who has scarlatina, whether in a severe or in a slight degree, makes round him an atmosphere in which other persons, if they have not previously had the disease, are very likely to become infected with it. Also, where death occurs, the body of the patient, while unburied, continues a centre of infection. The property of infectiousness attaches probably more or less to all matters which pass from the body of the patient during his disease and convalescence ; but doubtless it belongs especially to those matters which come from the throat and nose, and from the skin of the patient : the former in foul fluid and solid discharge, and tainting the breath of the patient ; the latter, particularly represented in the flakes and grains of dry skin which, after the first few days of the disease, begin to be shed in the so-called peeling or desquamation. During the illness of the patient infectious particles of these sorts are plentifully diffused in the air round about him, abound in his clothes and bedding, and may attach more or less to all objects in the room. If left to themselves they preserve their infectiousness for very long periods of time ; so that, for instance, handkerchiefs which have been used to the patient's mouth and nose, and bedding and clothing which contain the bran-like dust from his skin, and in various degrees all things which have been in use in the room, and the dress of persons who have attended there, may, for an indefinite time, be sources of danger. And it is by reason of particles of this kind still hanging about the persons of convalescents, or remaining attached to their clothes, that the contagion of the disease is so persistent.

In taking precautions against the spread of scarlatina, the above points have to be applied, as far as practicable, as follows. Every person who sickens with the disease should at once be removed from among the healthy ; and if his circumstances do not permit of this being done in his own home, he ought to be treated in hospital. The room to be used as sick room should, if possible, be one which has a passage or staircase to itself as apart from the general passages of the house ; and it should admit of being thoroughly well ventilated (as by windows and chimney) directly into the open air. It should be divested of every unnecessary thing to which dust and fluff are likely to attach. Persons in attendance on the sick should be persons who already have had the disease. Between the sick room and the rest of the house there should be no unnecessary intercourse. In the room, and on the person of the patient, every practicable disinfection should be effected without delay. Some strong disinfectant fluid should always be in use in the room for the various occasions which arise, with reference to the discharges and utensils of the sick, and the hands of the attendants. Handkerchiefs and other like articles, as soon as fouled by the patient, should be well scalded with boiling water, or immersed in the disinfectant fluid ; and bedding, and other like articles which cannot be treated thus extemporaneously, should be removed, suitably packed, to the place where they can be otherwise disinfected. It is believed that the dispersion of contagious dust from the patient's skin is impeded by keeping his entire body (including limbs, and head, and face) constantly anointed with oil or other grease ; and some practitioners also believe this treatment to be of advantage to the patient himself. When the patient's convalescence is complete, the final disinfection of his surface should be effected by warm baths, with abundant soap, taken on three or four successive days, till no trace of roughness of the skin remains. After this process and with clean clothes, he may be deemed again safe for association ; but, previously to this, however slight may have been his attack he ought always to be regarded as dangerous to persons susceptible of scarlatina. This caution is of particular importance with regard to schools ; and the neglect of it when children return to school, after they have had slight scarlatina, is often a principal source of epidemic infection in districts. Intercourse from houses in which there is scarlatina with other houses should not be more than necessary; especially children from infected houses (who often may themselves be breeding the disease) should not be allowed to frequent schools and other assemblages of young people.

Precautions against scarlatina.

The bodies of persons dead of scarlatina should be buried with the least possible delay, and should not ever, in the meantime, be kept in rooms inhabited by living persons.

When scarlatina has ended in a house, the sick room should be thoroughly cleansed and disinfected before being again used by healthy people.

Chemical disinfectants are of two great classes, and hitherto it is not certain which of the two classes acts best. The one class is well represented by *chlorine and certain of its compounds;* the other is well represented by *carbolic acid.* Under the one system, the solution of chloride of lime may be used for minor domestic purposes, and chlorine gas for disinfection of rooms. Under the other system, carbolic acid may be used for minor domestic purposes, and sulphurous acid gas for disinfection of rooms. These systems do not combine well with one another; and in the choice which has to be made between them, it will be convenient that the local authority should declare which of the two systems it adopts, and that all private disinfection in each district should follow such lead of the authority. The detail in each case will be advised by the medical attendant. In public disinfection establishments (under section 23 of the Sanitary Act, 1866,) for the disinfection of wearing apparel, bedding, curtains, and other large household articles, the most convenient process consists in employment of high degrees of heat.

SUPERVISION OF LOCAL NUISANCE-JURISDICTIONS AND WATER-SUPPLIES.

During the year 1869 there were 41 cases where my Lords had to communicate with the respective local authorities on questions of common sanitary administration; almost invariably with reference to outbreaks of typhoid fever and other diarrhœal infections, or to existing local conditions which justified an expectation of such outbreaks. In 20 of these cases, local inquiry by an inspector under their Lordships' directions was deemed necessary; viz., with immediate reference to typhoid fever, at *Spinkhill* and *Barlborough* near Chesterfield, at *Scothern* and *Ingham* near Lincoln, at *Cockfield* and *Gainford* and *West-Auckland* in the county of Durham, at *Audley* and *Allsager-Bank* in the Potteries, at and about *Wombwell* in Yorkshire, at *Dorking* in Surrey, at

Local inquiries into sanitary administration.

Local inquiries into sanitary administration.

Wicken-Bonant in the Saffron Walden union, and at *Coventry*;—with immediate reference to typhus as well as typhoid fever, and on a subsequent occasion with reference to questions of medical relief for the sick, at *Merthyr Tydfil*;—with reference to questions of polluted water-supply, at *Bridgewater* and at *Burley in Wharfdale*;—with reference to dangerous neglects in sanitary administration, at the towns of *Stamford* and *Wakefield*, at *Watlington* in the Henley-on-Thames union, at *Brimington* in the Chesterfield union, and at *Silsden* in the Keighley union. In relation to the last-named two places particular motive was given for the inquiry by the existence of very severe scarlatina. Inquiry by one of their Lordships' inspectors was also made in 1869 at the *Female Orphan Ayslum, Beddington*, Surrey, with reference to a serious outbreak of typhoid fever which had affected 50 of the 153 young inmates of that establishment. And to the above enumeration I have to add that an important inquiry was made by my Lords in 1869, with reference to certain accusations which had been brought against considerable sections of the commercial *Water-Supply of London.*

Excremental nuisances in relation to disease.

1. The circumstances which alone enable typhoid fever and most other diarrhœal infections to become epidemic or endemic in this country are now so well known to the educated parts of the public, and have so very frequently been illustrated in my previous reports by detailed analyses of particular cases, that I no longer think it necessary to expatiate anew on their disgusting particulars in connexion with each year's new illustrations. The experiences of 1869, substantially uniform with one another, and equally in accord with previous observations, repeat again and again the general lesson, that the infections here mentioned denote excremental poisoning. The details are of course not identical: yet even in them the limits of local variation are narrow: and the differences are in fact little more than whether the filthy infection has been embodied in air or in drinking-water. Sometimes we find, as at the Beddington Orphan Asylum, that unskilled arrangements for house-drainage, causing the very mischief they are meant

Excremental nuisances in relation to disease.

to avert, admit into the interior of dwellings larger or smaller eructations of sewer-air; sometimes, as in the lamentably instructive case of Wicken-Bonant, we find a source of drinking-water fatally infected in ways which have escaped popular suspicion; sometimes, with such brutal habits as the inspector found permitted at Wakefield, "even in broad daylight people "are seen easing their bowels into the beck which afterwards "supplies them with drinking-water;" and but too often, as was illustrated this year by most of the epidemics on my list, not even a pretence of decent cleanliness is shewn in such matters as are here in question, but excrement and all other sorts of animal and vegetable refuse are so stored in putrid heaps and soaking pondage about the dwellings and beside the wells, that they pollute impartially both air and water, and infect the human body by every channel of communication.

In each of the above cases, my Lords of course represented the state of things to the authority locally answerable for it, and did what lay in their power to procure its immediate amendment. It is lamentable however to know that any good which the public health may thus have gained during the year bears but an infinitely small proportion to the total needs of the public in the same matter. The above cases were but a few samples, accidentally disclosed, of evils which no doubt are almost everywhere present in greater or less amount throughout the length and breadth of the country; evils, which in their worst degrees often, very often, involve such filthiness of life as can only be stigmatised as bestial; but against which, in the present state and circumstances of the law, my Lords cannot pretend to be able to take systematic and really effective action. And yet, from the continuance of such conditions, the inhabitants of this country are sustaining damage year after year to a really appalling extent. The deaths are but a part of the mischief—for that needless warfare against human life has its wounded as well as its killed—yet even the deaths are in myriads. The 15–18,000 deaths by typhoid fever, which annually occur in England, are essentially due to such conditions: on such equally

Excremental nuisances in relation to disease.

depends the power of imported cholera to become epidemic among us: and, of the 15–30,000 deaths per annum which are registered as due to our ordinary diarrhœal diseases, a very large proportion are undoubtedly of the same source. Moreover though, beyond this point, the admixture of causes is too intricate for equally exact proofs to be possible, it is not for a moment to be supposed that the above-described terrible causation of fatal bowel-infections is the only mode in which excremental mismanagement affects the public health. Of the mortality of young children, not referred to bowel-infections, probably a very large share (much of it registered as "convul-" sions") is due to excremental poisoning; and it seems highly probable that many zymotic diseases, besides those I have mentioned, find in similar circumstances their amplest opportunities for mischief. All this, in substance, is an old story. It has long been among the most fixed of the certainties which have relation to civilised life, that, wherever human population resides, the population cannot possibly be healthy, cannot possibly escape recurrent pestilential diseases, unless the inhabited area be made subject to such skilled arrangements as shall keep it habitually free from the excrements of the population. In contrast with the fact that our reckless non-provision of such arrangements costs us annually some tens of thousands of lives, it is nevertheless certain that in England for the last twenty-two years the provision of such arrangements has been deemed proper subject-matter of public law, and that for the last four years enactments have been in our statute-book which purport most compulsorily to enforce them. The circumstances under which the intentions of our law are practically for the time almost inoperative, were explained in my last year's report, and have remained to the present time substantially unchanged. Probably the period is now not distant, when the Royal Sanitary Commission will have presented its report as to the reforms which the law requires, and when the wisdom of Parliament may be expected to provide an adequate and final remedy for evils so immensely great.

Contrivances for preventing excremental nuisance.

Meanwhile, both with the view of aiding local authorities to a better discharge of their duties in relation to the present subject-matter, and also with reference to discussions which might probably arise when certain details of the new sanitary law should have to be settled, my Lords thought it expedient, during 1869, to collect all procurable information as to the various special contrivances which are in use in Great Britain (other than ordinary water-closets) for preventing excremental nuisance, and as to the measure of success which each such contrivance attains. Accordingly, under their Lordships' directions, extensive local inquiries were made, the results of which are stated in the two annexed reports: the one, by Dr. Buchanan, on the *dry-earth system* of dealing with excrement; the other, by Dr. Buchanan and Mr. Radcliffe conjointly, on the *midden-closets, pail-closets, and water-supplied trough-closets,* of the poorer districts of certain northern towns. It is not necessary for the purposes of the present report that I should here attempt to weigh at all exactly the comparative merits of these various arrangements; but the broad results which I would wish to bring into relief, as for legislative purposes all-important, are: first, that local authorities, willing properly to exert themselves for the prevention of excremental nuisances, have at their disposal various ways by which that end can be more or less perfectly attained; and secondly, that a law, imperatively refusing to tolerate such sorts of nuisance, does not, in its relation to local authorities, represent a claim for wonderful exertions or lavish expenditure, but a claim which, even where circumstances are least favourable, can be easily and ought to be cheerfully met.

Complaints against London water.

2. The circumstances under which my Lords made inquiry in 1869 with regard to parts of the commercial water-supply of London were as follows. Professor Frankland, the eminent chemist who habitually observes the London waters, and the results of whose observations are published monthly by the Registrar-General, had for some time found abundant evidence of defective filtration in a great part of the supply. The water, I need hardly say, ought invariably to answer to the epithets "clear and transparent;" but, during the two years 1867–8, only two of the eight London companies had been

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found pretty uniformly to give such water; these two being the West Middlesex and the New River companies. Of companies distinguished in an opposite direction, the Southwark-and-Vauxhall company had been incomparably the worst offender; of the twenty-four monthly reports made on its waters during those two years, 22 had described the water as more or less turbid. In the same twenty-four reports, the like blame has been found attaching to the water of the Grand Junction company 7 times; to that of the Chelsea company, 8 times; to that of the Lambeth company, 9 times; to that of the East London company, 11 times; and the Kent company's water, on which only sixteen reports had been made, had, on half of these occasions, been more or less censured. Meanwhile the West Middlesex company (which yet draws from the same part of the Thames as the Southwark-and-Vauxhall company) had been reported only once, and the New River company only twice, to be giving water described as "slightly "turbid." Of the 68 occasions on which waters had been called turbid, there were 40 on which the turbidity had been called "slight." Of the 28 occasions when it was more than slight, the blame attached 3 times to the Chelsea water, 4 times to the Grand Junction water, 5 times to the Lambeth water, and 12 times to the Southwark-and-Vauxhall water; and the epithet "very turbid," used altogether eight times in the twenty-four reports, was applied twice to the Chelsea water, three times to the Lambeth water, and three times to the Southwark-and-Vauxhall water. It was evident that several of the companies had been acting in habitual contravention of the Metropolis Water Act, 1852, by delivering their supplies of water without such filtration as the law requires; and in the spring of 1869, when the matter came particularly under notice of this department, the Southwark-and-Vauxhall company and in a less degree the Lambeth company (companies which between them supply more than a fourth part of the entire metropolitan population) were still in a high degree incurring the same sorts of censure as during the long preceding period. Their waters were described as containing live organic forms, and as being, in January and February, so very turbid as to be "entirely

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"unfit for domestic use without previous filtration." Against the Southwark-and-Vauxhall company there further lay the extremely serious suspicion, that in the autumn of 1868 it had actually distributed to its customers tidal water drawn from the Thames at Battersea, and had thus disobeyed the Act of 1852 in a matter of supreme importance to the public safety.

Under the above circumstances, and recognising as certain that the intentions of the Legislature, in regard of the metropolitan water-supply, were not being properly fulfilled, my Lords thought it necessary, in the interests of the public health, to have a full investigation of the matter. The inspector to whom this duty was assigned was Mr. Radcliffe, who in 1866 had most ably investigated the operations of the East London water-company, in connexion with the cholera epidemic of that year. He was instructed to inquire particularly into the working arrangements which had enabled the Southwark-and-Vauxhall and Lambeth companies (being the two companies now chiefly impugned) to distribute such waters as had been complained of; and, as he would necessarily have to compare these working arrangements with those of the other companies drawing from the Thames, he was incidentally to report also on the latter; but the works and arrangements of the three companies which do not draw from the Thames (the New River, East London, and Kent companies) were not to be included in the inquiry. Mr. Radcliffe's thoroughly complete and conclusive report on the results of his examinations is subjoined (Appendix) *in extenso*, and I need not here do more than refer to its general verdict.

First, as regards the facts of turbidity, Mr. Radcliffe found Dr. Frankland's assertions abundantly confirmed by others; and especially as regards the Southwark-and-Vauxhall company, he found the officers of health in districts where the water was supplied writing of it as having been "almost "uniformly throughout the whole of last winter very turbid "and of a yellow colour," and comparing it "to diluted pea-"soup or to a yellow November fog," or describing it as "during the winter and spring very much stained and marly,"

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and when received direct from the mains into the Bermondsey public baths, "frequently quite useless, although the company have put a strainer on the supply-pipe to keep back "dead fish and other matters, which show the unfiltered "state in which it is often delivered." And even after Mr. Radcliffe's inquiry, Dr. Sanderson of this department, on making microscopical examination of the two waters, found both of them characterized in a way which, in the light of present medical knowledge, seems to me of very bad significance: *i.e.*, not only containing such larger organic forms as may merely represent defective filtration, but also infested by those extremely minute actively-moving particles (apparently the *microzymes* of our contagion research) which, if not at present to be identified as actual seeds of disease, at least "probably afford proof that chemical decomposition is in "actual progress, and that the water containing them is in "such a state as to be improper for consumption."

Next, as regards the causes of the turbidity, Mr. Radcliffe found two sufficient explanations for the frequent or habitual delivery of turbid water by the Southwark-and-Vauxhall and Lambeth companies: first, that the works had not provided sufficient extent of filtering surface; and secondly, that the works had not enabled sufficient time to be allowed for subsidence, preliminary to filtration. In the case of the Southwark-and-Vauxhall company (which before Mr. Radcliffe's inquiry had taken measures to remedy the above deficiencies) the deficiencies had been of the worst effect, that, owing to the company's further want of service-reservoirs, the rate of filtration had had to be very greatly accelerated during the hours of maximum supply. And in the case of the Lambeth company, there had been also a special disadvantage in the fact that this company (in common with the Chelsea company) draws its supply of water from a part of the Thames which is peculiarly apt to be turbid. Mr. Radcliffe further concluded that in the case of the Southwark-and-Vauxhall company, the turbidity had certainly in some cases been caused by the admission of unfiltered water from the subsidence-reservoirs direct into the pump-wells for distribution, and probably in certain other instances by the

Complaints against London water.

admission of tidal water from the Thames. With regard to the latter most condemnatory opinion, he admits that water may have accidentally soaked or leaked from the river at Battersea-Reach; but he also particularly points out that he found the company still maintaining the old conduit by which, prior to 1855, it normally filled its reservoirs from that part of the river. I think it on the whole probable that the company is not guilty of having intentionally drawn tidal water from the Thames: but, that it intentionally distributed unfiltered water from its subsidence-reservoirs, and at least negligently received an admixture of tidal water from Battersea-Reach, cannot, I think, be disputed. Of course, as regards any possibility of accidental leakage or soakage from the river, the company's works ought to be so constructed that no such accident could happen. And as regards the possibilities to intentional malfeasance in either of the respects here referred to, I quote, with entire concurrence, Mr. Radcliffe's practical suggestion:—"It should be "required absolutely of the company that the communication "of the reservoirs at Battersea with the tidal portion of the "Thames, by means of the old conduit leading to Battersea-"Reach, and the direct communication of the subsidence-"reservoirs with the pump-well, should be entirely cut off. "Any contingencies that might arise which would apparently "at the moment justify the company, as a matter of ex-"pedience, and notwithstanding the illegality of the acts, in "taking water into their reservoirs through the conduit "communicating with the tidal water of the Thames, or "in permitting unfiltered water to pass directly from the "subsidence-reservoirs into the engine wells for distribu-"tion, can be provided for in other and more legitimate "modes."

Water supplies generally, in relation to public health.

It seems to me, however, that in connexion with the above case the public has some further points to consider; and though I have perhaps on other occasions sufficiently acquitted myself of my duty to bring such points under consideration, yet, having regard to the extreme importance of the matter, I venture once more to insist on them.

Water supplies generally, in relation to public health.

The doctrine, in general terms, that a vast influence is exercised over the health of communities by the quality of the water which they consume, is one which, as far back in literature as any reference to such questions could be expected to exist, may be seen to have universal medical consent in its favour; and, during long ages of history, the common instincts of mankind were even surer and stronger than undeveloped science could be, in revolting against the use of unwholesome waters: so that (for instance) among the lessons which survive to modern times from the wonderful intellect and vigor of ancient Rome, the frequent far-reaching aqueducts, which record an unbounded care for the provision of proper urban water-supplies, are monuments kindred in spirit, and only second in dignity, to the consummate system of jurisprudence of the same singularly organising people. Of the many invaluable additions and improvements which medical knowledge has received within the last quarter of a century, scarcely any can in my opinion be compared, for present practical importance, to the discoveries which have given scientific exactitude to parts of the above-stated general doctrine, and have enabled us definitely to connect the epidemic spread of bowel-infections in this country with the existence of certain faults of water-supply. Not only is it now certain that the faulty public water-supply of a town may be the essential cause of the most terrible epidemic outbreaks of cholera, typhoid fever, dysentery, and other allied disorders; but even doubts are widely entertained whether these diseases, or some of them, can possibly attain general prevalence in a town except where the faulty water-supply develops them. Within the last few years these truths have again and again been set before the public; but, as the tragedies which illustrate them are too often forgotten as soon as acted, some present recapitulation of past experience may be permitted me.

Relation of cholera to water-supplies.

(*a.*) In 1848, when the second great Cholera-visitation of England was impending, the then Metropolitan Sanitary Commissioners, in publishing the information which they had obtained concerning the habits of the disease, quoted that in-

Relation of cholera to water-supplies.

Moscow, the year before, the epidemic in the sixth week of its existence was observed to have confined itself principally to districts south of the river, where the population had only the impure river-water to drink; the cases in the northern districts, where an excellent water-supply had been provided, having been but few and scattered; whereas, in the epidemic of 1830, when the northern districts had not yet obtained their better water-supply, cholera "extended to every part of "the town in 17 days, and reached its maximum (118 deaths "per diem) after a duration of one month."

(*b.*) In the autumn of 1849, at the height of our terrible second epidemic, Dr. John Snow, in an admirably lucid and original little paper contributed by him to a medical journal, advanced the doctrine which has long been identified with his name, that cholera propagates itself from person to person by means of the intestinal discharges of the sick; and he claimed for this doctrine that it gave the true explanation of the influence which sewage-polluted water had been seen to exercise, and was, he believed, in London at that moment exercising, to determine the local distribution of cholera. Dr. Snow, in 1849, was not able to furnish proofs of his doctrine: against which, too, at first sight some strong arguments seemed to hold: but afterwards (and happily in great part before his premature and lamented death in 1858) distinct experiments, as well as much new collateral information, established as almost certain that his bold conjecture had been substantially right.

Cholera in Newcastle in 1853.

(*c.*) In 1853, our share in the third great cholera-visitation of Europe began with a frightful epidemic at Newcastle and Gateshead, which killed in a few weeks nearly 2,000 persons out of populations not amounting to 120,000; and when Her Majesty appointed commissioners (Mr. Joseph Burnley Hume, Mr. John Frederic Bateman, and myself) to inquire into the causes of that epidemic, it was found that the water-company supplying the two towns had at the time very improperly been drawing about a third part of its supply from the tidal and refuse-receiving Tyne. The commissioners reported, "We cannot but come to the conclusion that the "water was such as ought never to have been distributed, Cholera in Newcastle in 1853.

" and that, on the most favourable view we can adopt, it
" must be regarded with grave suspicion in relation to its
" influence on the late outbreak . . . . It is matter of history
" that in the two cases in which cholera has raged violently
" in Newcastle, viz., in 1831 and 1853, the water supply has
" (owing to a sudden failure of other sources) been more or
" less derived from the Tyne, and that in the third case, in
" which the supply of better water continued abundant, viz.,
" in 1848–9, the outbreak of cholera was light and mild; and
" further, as a coincidence, if nothing more, that [in 1853] on
" the fifth day after the company ceased to draw from the
" Tyne, and within a still shorter period after the time when
" all admixture of Tyne water in the pipes and reservoirs of
" the company will by perpetual dilution have passed away,
" the late outbreak of cholera did certainly commence a rapid
" and never-checked decline."

Cholera in London in 1853-4.

(*d.*) In 1854, when cholera prevailed with great severity in London, Dr. Snow urgently insisted on local illustrations which he was able to show, and which were now beginning to be commonly recognised, of the broad connection of the disease with water supply. One case to which he particularly drew attention, and which afterwards was exhaustively examined by a local committee, was the relation of a particular well in the neighbourhood of Golden Square, and much used in that neighbourhood, to a cholera-outbreak of extraordinary vehemence in the parish of St. James's, Westminster; and another fact on which he insisted, and which eventually became most conclusive for purposes of demonstration, was that, whereas throughout one very large section of the metropolis two water-companies were supplying different waters, the customers of these two companies were suffering in widely different proportions from the epidemic. At that time I had the honour to be associated with many eminent members of my profession in a Medical Council, which the president of the then General Board of Health had convened to advise him in relation to the epidemic; of which council a Committee (consisting of Dr. Arnott, the late Dr. Baly, Dr. Farr, Professor Owen, and myself) was requested to suggest and supervise such scientific inquiries about the disease as might probably elucidate its nature and causes; and this committee, having had its attention drawn to the last-mentioned very remarkable inequality of cholera-distribution, recommended that the facts of the case should be further investigated, and as far as possible compared with previous experiences in the same district. Very copious details of information were in consequence asked for; but unfortunately these could not be collected before the time when the committee had to make its final report; and in 1856 it devolved upon me (who meanwhile had been appointed Medical Officer of the Board) to report on the statistics which had been compiled.* Cholera in London in 1853–4.

(*e*.) In the years 1865-6, England suffered a fourth cholera-visitation. In the meantime Dr. Snow's doctrine of the mode in which cholera propagates itself had assumed scientific importance: for in 1856 Professor Thiersch, then of Erlangen, had proved, by direct experiments performed on lower animals, that the infection of cholera can operate in the way which Dr. Snow supposed; and consequently, during our fourth visitation, attention was given more vigilantly than before to the influence of foul water-supplies (particularly of water-supplies infected with specific contagium) in promoting epidemics of the disease. Two cases of special importance were observed: one relating only to a private well, while the other related to a great London water-company; and I shall here describe both of the cases, as the minor of them serves to throw light on the major. Cholera in 1865-6.

The former is detailed in my eighth report. In the summer of 1865 cholera approached us from the Mediterranean; Egypt had been badly infected by Mohammedan pilgrims returning from Mecca; the infection had spread along the lines of steamboat communication which diverge from Alexandria as a centre to all the most considerable ports of the Levant and of southern Europe; and presently, as was expected, a first wave of the infection touched our shores. For the first time in our experience the attack was on our south coast. [For particulars of this instructive case, see above, pp. 226–30.] Theydon Bois cases.

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* On the two Cholera-Epidemics of London, 1848–9 and 1853–4, as affected by the consumption of impure water, Vol. I., pp. 411–24.—J.S.

East London Cholera epidemic in 1866.

The second case to which I have to refer as belonging to our fourth cholera-visitation, is that of the East London water-company, in relation to the great cholera epidemic of 1866. This case was very minutely examined under direction of the Lords of the Council; and the admirable statement which their Lordships' inspector, Mr. Radcliffe, made of the results of his elaborate inquiry is given, together with some observations of my own, in the appendix to my ninth report. The water-company, through its engineer, acknowledged to having acted in contravention of the law, by distributing for public use a water, and a most improper water, which had not passed through its filter beds; and Mr. Radcliffe's inquiry led him to conclude that this water had caused the epidemic. There were some difficulties in the case which I confess myself not to have been able to explain fully to my own satisfaction; but the broad conclusion, that the East London water-company caused the East London cholera epidemic was supported, in my opinion, by almost irresistible arguments; and I give Mr. Radcliffe's verdict in the words in which he closes his report on the fourth cholera-visitation of London:—

"The outbreak in the metropolis was one of a succession of phenomena which indicated a wide-spread diffusion of cholera infection in the kingdom during the month of June 1866, and this diffusion was inseparably connected with a direct dissemination of the infection from the Continent. The earliest unquestionable cases of the outbreak took place on the 26th June 1866, ... and the outbreak reached its acme in the fifth week following. The mortality among the population was proportionately less from this outbreak than from any previous outbreak in the metropolis, but the disease was not less fatal in proportion to the number of persons attacked. Of the mortality of 5,915 no less than 4,276 occurred in the east districts of the metropolis and adjacent suburban districts of West Ham and Stratford. It was in these districts that the disease underwent the rapid and unexampled development which gave to the outbreak such formidable proportions in the fifth and sixth weeks of its duration. The unusual development of the epidemic in the east districts, as compared with the rest of London, began in the week ending the 14th

East London Cholera epidemic in 1866.

July; in the week following the rate of increase, as compared with the previous week, was nearly *seven* times greater than in the rest of the metropolis; but in the subsequent week the rate of augmentation became virtually the same over the whole of London. Neither the meteorology of the period, nor altitude, nor the nature of the soil, nor density of population, nor filth, nor the state of the sewerage, nor locality, affords any explanation of the peculiar localization of the outbreak in the east district. There is but one condition known which might become capable of propagating cholera common to the whole area of the outbreak, namely, the water-supply. The sudden and virtually contemporaneous development of the outbreak over the entire area of prevalence indicated a medium of propagation common to, and capable of, rapid diffusion over the whole area; its sudden declension indicated the temporary efficiency to this end of such a medium. The area of prevalence approximated with remarkable closeness to a particular field of water-supply, and there are facts which seem to prove that this approximation was not accidental. It is known that, immediately prior to the outbreak in the east districts of the metropolis and neighbouring districts across the Lea, impure water was distributed over this field of supply, and it is highly probable that this water was charged with choleraic poison. It is submitted that these facts and inferences supply a sufficient and legitimate explanation of the great and explosive development of cholera in the east of London and its suburbs during the recent outbreak; and it is argued in respect to a serious objection to this theory, arising out of the actual or relative immunity from cholera of certain districts and institutions supplied with the suspected cholera-infected water, that in the present state of our knowledge of the outbreak, the positive and more generally applicable facts may justly, and for practical purposes, warrant a conclusion apparently in contradiction with certain negative facts of much more restricted application."

Typhoid fever epidemics.

Hitherto I have spoken only of cholera, but another and even more important disease claims also to be mentioned. Among the circumstances which we find associated with outbreaks of Typhoid Fever, there is none of more frequent occurrence, none which we are more entitled to consider directly causative of the disease, than the consumption of polluted water. It has been one of our most familiar experiences, one which my reports for many years past have again and again been obliged to exhibit in all its nauseous details, and which in the present report receives a new and striking illustration, that excremental fouling of wells is, in this respect, among the worst dangers which can threaten the health of a community; and it might be assumed that other common water-supplies, as distributed by companies and local boards, would equally be capable of spreading the infection. Cases to this effect have not yet accumulated in regard of typhoid fever as abundantly as in regard of cholera, but from my 10th report I beg to quote an illustration which doubtless will be deemed sufficient.

Unprotectedness of the public against water-companies.

From this long digression on the general question of the influence of foul water-supplies on the distribution of certain epidemic diseases, I return to the particular question of the water-supply of this metropolis. I have been anxious to show, even if redundantly, what enormous risks to the public are implied in any slovenly administration of such supplies; yet, as regards the London supply, what imperfect obedience to the law, and in some cases what systematic and flagrant disobedience, was exhibited during the time to which Mr. Radcliffe's inquiry referred; and, above all, what criminal indifference to the public safety was illustrated by the proceedings of the Southwark-and-Vauxhall Company. In the case of this company, not only had there been the long-standing gross insufficiency of the apparatus of subsidence and filtration: an insufficiency which at length, under continued pressure from without, is said to have been for the time amended: but, worse, the administrators of the supply had from time to time, as they found convenient, dispensed to a great extent with even a pretence of filtration, and during part of the time under review had, worst of all, either negligently or wilfully distributed as part of their supply the interdicted tidal water of Battersea-Reach. What might have been the result of these malfeasances, if cholera-infection had at the time been in London, the reader of my previous pages can judge. In those pages are stated some of the dreadful antecedents of this very company in that same relation to human life; homicidal antecedents, on a really stupendous scale; antecedents, as to which the company might no doubt urge in extenuation that, till 14 years ago, the injuriousness of its then water-supply was unproven; but as to which, since the report of 1856, the damnatory proof has been absolute. And this company, with those antecedents, is now found the worst offender against the too lenient Act of 1852; experimenting again, as though its previous experiments had been inconclusive, on the lives of some hundreds of thousands of people; and apparently trusting (but may be with an ill-founded trust) that the forgetfulness or indifference of public opinion will condone also this iniquity.

My duty to the public obliges me most urgently to represent the extreme inadequacy of the law, in its present state, to provide for the public safety against such perils as are here under consideration; and in this context I beg leave to repeat the language which I used three years ago, when referring in my ninth report to the then recent calamity of the East London cholera epidemic, as connected with an illegal and most culpable act of the East London water-company. [See above extracts from Ninth Report, pp. 287–9.]

Question of pecuniary compensation for persons injured by breaches of sanitary law.

Finally, with reference to all the subject-matters of this section of my report—matters of nuisance-jurisdiction as well as matters of public water-supply, and in view of the fact that at the present time, under Her Majesty's Commission, the whole sanitary law of this country is being systematically reconsidered, I beg leave to terminate this section by submitting again for consideration what I said in my tenth report on the general question of responsibility in matters of common sanitary concern. [See above, pp. 331–4.]

AUXILIARY SCIENTIFIC INVESTIGATIONS.

Auxiliary scientific investigations.

The pathological work of the department was in 1869 carried on as usual in its two branches; and the subjoined reports [A] by Dr. Sanderson and Dr. Thudichum will shew that it was in matters of the utmost interest. The work represented in the two reports is undertaken from two opposite points of view; and the investigators cannot at present act in precise concert as to its details; but though now the respective shares of work are in a certain sense independent of each other, it may be anticipated that sooner or later (as in some great subalpine tunnelling) the approaches thus oppositely begun will meet and become mutually subservient. Dr. Sanderson's work, advancing from the ætiological side of the subject matter, has during the year broken ground in singularly important studies concerning the natural history of the contagia; and Dr. Thudichum's work, which may be regarded as concluding his long series of preliminary researches introductory to the chemistry of disease, has, he believes, at length given him a basis from which he can proceed with some confidence, and with infinitely better prospects of success than before, in the task of chemically investigating individual morbid processes and their results.

The general intention of these two branches of investigation has been explained in other of my annual reports; and in the stage at which the investigations now are, the exact nature and immediate tendency of last year's work will probably be better learnt from the details of the two appended papers [A] than they can be from any more generalised description of the work, or from any hitherto possible synopsis of its results. Accordingly, I confine myself here to such notice of the two reports as may serve to indicate the point of view from which each of them has to be read.

Natural history of contagia.

1. First, as regards the *ætiological work,* Dr. Sanderson, in 1869, as I have said, began researches in a new direction. We believe that at last it has become possible, with the assistance of the microscope, to make direct studies of the

Natural history of contagia.

intimate nature and natural history of the contagia; and so far as this is true, the scientific and practical interest which must attach to such studies is transcendently great. No doubt it would be a mere enthusiasm to think of the possible far-off knowledge of these things as if the scientific labours of a year or two could attain it, or even as if each fragment of the knowledge, on being attained, must be capable of immediate popular application; but, that such knowledge as is here in question must sooner or later, if it can be attained, be of the largest conceiveable advantage to mankind, is a certainty which science cannot fail to see, as its own great encouragement to labour, and which indeed anyone can fairly appreciate with but little technical information. Looking at the ravages which are every day suffered from familiar diseases of the zymotic class, such as typhoid fever, and typhus, and small-pox, and scarlatina, and measles, and hooping-cough; and adding to these the less constant, but occasionally terrible, destructiveness of diphtheria and of cholera; adding further the consequences of venereal diseases; adding again those serious traumatic infections which make the chief common danger of surgical operations and injuries; every one can see that the field of zymotic pathology (throughout which, notwithstanding all present resources of preventive medicine, there is urgent need of the exacter knowledge here spoken of) is of enormous extent and incalculable importance. But in fact the field where such exacter knowledge may be fruitful is many times larger than that enumeration would suggest. Even as regards man, recent researches suggest as in the highest degree probable, that the domain of our zymotic diseases is much larger than has been supposed; that, for instance, very possibly tubercle, and not impossibly even cancer, may each pre-suppose, as one of its essential factors, the existence of some ferment which first operates on the human body from without. And then let it be remembered, as we regard all this immense field of human suffering, that man is but one of innumerable forms of life subject to similar devastation. Every domestic animal may be expected to benefit, equally with man, from the growth of genuine scientific insight

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in matters of zymotic pathology; and questions of quite equal importance in relation to the most useful parts of the vegetable kingdom are either themselves questions of zymotic pathology, or questions which may be very greatly enlightened as the knowledge of animal contagia extends. Direct studies of the intimate nature and genesiology of the most tremendous causes of disease are, then, the studies which are here in question; and, with the estimate which I have of the importance of such studies, I am particularly glad to report that our scientific work of the year includes a beginning of labour in this direction. Our ætiological investigations of tubercle, described in my last two reports, had (from two or three different directions) led us to confines where it seemed we were entering on questions of zymotic pathology. And so, doubting whether even with tubercle more ætiological knowledge could be got till the morbid ferments should have been better studied, we in 1869 began the latter study. Dr. Sanderson's present report does not pretend to be more than introductory in the matter. It discusses generally the ultimate constitution of the contagia; shewing experimental reasons, which we think conclusive, for believing that each contagium, as regards its physical form, consists essentially of *extremely minute separate solid particles;* and arguing, on grounds which we think scarcely less certain, that these effective particles of each specific contagium are *living self-multiplying organic forms.** In my annual report of six years ago, when incidentally I had occasion to refer to the intimate nature of morbid infection, I quoted, as of extreme interest to that question, the experiments of Prof. Schröder and M. Pasteur on the ordinary processes of fermentation and putrefaction; experiments, purporting to connect each specific fermentatory or putrefactive change with the presence and self-multiplication of some characteristic form of microscopical life; but at that time,

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* In this report, where I have made much reference to the late Dr. Snow's theory of cholera, it may be proper to note that he, believing the cause of the disease to be a *contagium vivum,* attributed to it "the property of reproducing "its own kind" in the intestinal canal of patients infected by it.—J.S.

Natural history of contagia.

though I could claim for zymotic pathology the utmost interest in an extension of these experiments, I was obliged to admit that "the conclusiveness of the experiments, in "the field to which hitherto they have been confined, is "still matter of the warmest scientific controversy."* It will now be seen that the views indicated in Dr. Sanderson's report with regard to the agencies of morbid infection are (*mutatis mutandis*) the views of Prof. Schröder and M. Pasteur on the agencies of fermentation and putrefaction; and I think it will be admitted that the latter views are importantly strengthened by the evidence which M. Chauveau and Dr. Sanderson supply from their other sphere of study, and with experiments of a new and critical kind, as to the essentially particulate form in which the morbid ferments exist and multiply. Professor Hallier's very striking doctrine, that contagium-particles, or (as we propose to call them) *microzymes,* are the respective micrococci of certain higher fungic forms which he names, and into which he maintains they can be artificially cultivated, is fully set forth in Dr. Sanderson's report, but has not yet come under our experimental examination. Knowing that all contagia (as such) are distinct one from the other, and believing that each of them has its essence in the so-called microzymes which it contains, we by implication impute to the microzymes that in different diseases they are not identical; and as we affirm them to be dynamically different, so also we assume that, under well-devised differential experiments, other signs of their specificity may be brought to light, and for each sort of them a definite genesiology be written. Hitherto, however, no work has been attempted by us but such as is more or less common to all contagia. And the extremely difficult task of devising the differential experiments which may settle this new branch of natural history is among the obligations of the future.

Chemistry of disease.

2. Secondly, as regards the *chemical work* of the department, I have mentioned that a considerable succession of

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* *See* extracts from Sixth Report, especially in the foot-notes at pp. 151–2. —J.S.

Chemistry of disease.

researches, which for the most part had been rather preliminary than pathological, was ended by Dr. Thudichum in 1869. The most important chemical problems concerning zymotic disease are problems of modified bodily decomposition —"modified," namely, as compared with that normal decomposition which every living body continuously undergoes; and it is of course an indispensable condition for being able to measure the morbid modification, that the normal or unmodified processes of decomposition shall first be accurately known. The investigations of previous observers in the latter field of research had not nearly reached the degree of development in which they could furnish complete standards of comparison for the products and processes of disease; and consequently Dr. Thudichum, before he could hope to make any progress with the chemical study of such diseases as typhus and scarlatina, had in various points to work out standards for his own use, and in several cases incidentally to improve the methods of procedure by which this kind of work is done. Thus it has been, that, of the chemical and spectroscopic researches hitherto made, the larger proportion have related systematically to the ordinary constitution and decomposition-products of the blood, bile, and urine, and to other kindred subjects; while, with exception of the large cholera research made in 1866, the direct investigations of disease have been fragmentary.* From the systematic prosecution of the former or physiological sort of researches Dr. Thudichum believes he has learnt to identify, and in many cases to know in considerable detail, a large number of previously unknown organic compounds;† and it must be obvious that, so far as this is the case, previous pathological researches within any sphere to which these compounds belong

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* The chief of the latter investigations have related to points of importance in the chemical pathology of malarious fever, tetanus, hydrophobia, morbus addisonii, intermittent cruenturesis, waxy degeneration, diabetes, and chronic liver atrophy. And one of them related to the physiological relations of alcohol. —J.S.

† Besides the new products described in the urine, and 7 new coloured ingredients of gall-stones, there are 18 new derivatives of hæmato-crystalline, and 6 new decomposition-products of albumen, and long lists of organic yellows other than of bile and urine, all named in Dr. Thudichum's papers, as having been for the first time identified, and in some cases extensively investigated, by him.—J.S.

Chemistry of disease.

would of necessity have been unsuccessful. Dr. Thudichum's appended report of last year's work may, in the sense of these observations, be referred to as especially illustrative and important. The continued elaborate studies of the products of albuminous decomposition (illustrated on this occasion by the papers on leucin, leucimide and tyrosin, and especially by those on the newly-observed volatile alkalies of such decomposition) represent work which, with that of two years ago on fluorescentine and other new decomposition-products of albumen, may hereafter be of the most important bearing on the detailed symptomatology of febrile diseases, and is evidently such as required to be undertaken before the poison-symptoms of fever could be rationally investigated. Even greater interest, however, attaches to some other studies which are now reported on: namely, to those concerning the chemistry of the urine: for the last paper of the series alleges, as its discovery, in relation to the normal constitution of the urine, that an ingredient which is the free acid of the secretion, and which in quantity constitutes about a fifteenth part of its entire solids, has hitherto been overlooked or misunderstood; and since in all diseases, acute and chronic, as well as in health, the urine is habitually referred to by pathologists, as measuring for them by certain of its ingredients the waste of nitrogenous material in the body, this paper of Dr. Thudichum's, besides being of fundamental interest to the whole subject-matter of our particular researches, must also, if its conclusions are accepted, be turned extensively to account for the immediate uses of medicine. Briefly, then, the chemical work of the past year claims to be regarded as contributing in its own province an important share to the physiological basis from which alone disease can be studied. And I may state in conclusion, that since at the date of this report we believe that basis to be sufficiently wide for the endeavour, Dr. Thudichum is now at once proceeding to the systematic and direct chemical investigation of two of the most important diseases of this country.

Milk of diseased animals.

3. It remains for me to mention, under the present head, a minor inquiry which my Lords directed to be made in 1869, on a point of immediate and popular interest: the question,

Milk of diseased animals.

namely, of *effects produced on the human subject by milk derived from animals suffering with the so-called foot and mouth disease.* In the autumn of 1869 this disease was on various occasions reported as prevailing among horned cattle in different parts of England; and my Lords availed themselves of some of these opportunities to cause local investigation to be made whether any human disease could be traced to the consumption of milk from the infected cows. Dr. Thorne made these local inquiries for their Lordships; and I subjoin in extenso [A] the report which he finally made of the results. I regret to state that, in spite of Dr. Thorne's ably conducted examination, the subject has not yet been quite divested of such difficulties as attach to conflicting testimony; and that in this respect no important advance has been made on the state of knowledge which I reported seven years ago.* If I then adverted to occasions on which, "when aphtha has been prevailing among the "cattle of a country, the human population in the same "places has suffered from the same or from some similar "disorder," and if I then mentioned, as seemingly made certain by experiment, "that at least under some circum-"stances the human affection may be caused by the con-"sumption of milk drawn from a diseased animal," so, on the present occasion, Dr. Thorne reports cases where decidedly the milk of diseased animals seems to have produced human disease. But, on the other hand, just as I was formerly obliged to quote strong negative testimony from large epidemics in Paris, and to admit as possible "that the frequency "of such communications of the disease, as compared with "the number of persons who (more or less) are consumers of "milk, is not great," so, on the present occasion, Dr. Thorne reports "that in a very large number of cases the milk of "cows undoubtedly affected has been used without producing "any noticeable morbid effects." We have not yet obtained any positive knowledge by which these opposite facts can be reconciled. Negative results would of course be expected where only boiled milk has been used; but from consideration

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* Fifth Report of Medical Officer of Privy Council, p. 89.—J.S.

Milk of diseased animals.

of the evidence I think it probable that dilution of milk, and also mere lapse of time may have to be taken into account, and that milk which after dilution, or after some hours' delay, does not infect, might have infected if taken neat or fresh. The positive evidence, however, is that to which the public ought to have chief regard; and bearing this in mind, I am clearly of opinion that the milk of cows with foot and mouth disease ought not to be unrestrictedly sold for human consumption.

From the Thirteenth Report to the Privy Council, 1870.

[The Thirteenth Report contains sections relating to the Special Diseases of the Year; the Supervision of Nuisances Removal and Diseases Prevention Authorities; Public Vaccination, which is omitted, *vide* Vol. I., p. 393; Constitution of the Medical Profession (transferred in the reprint to the Section devoted to that subject, Vol., I., pp. 518–24); The Practice of Pharmacy (also for convenience transferred to Vol. I., pp. 553–4); Auxiliary Scientific Investigations.—Ed.]

THE SPECIAL DISEASES OF THE YEAR.

Special Diseases of the year.

In introduction I have to state that the two epidemic diseases which in 1869 had required particular attention from this department continued seriously prevalent in 1870: namely, that *Relapsing Fever* which at the date of my last report had scarcely excited much apprehension except in London, where then it had begun to decline, afterwards increased very considerably in other of our great centres of population—particularly at Liverpool, and, in a less degree, at Leeds and Merthyr-Tydfil; and that *Scarlatina*, which also at the date of my last report had begun to diminish in London after an epidemic of extreme severity, has till now continued ravaging other parts of England with its extraordinarily fatal prevalence. Besides these causes of anxiety in relation to the public health in 1870, there began early in the year signs of a recommencing ascendency of *Small-pox* in England; and before the close of the year it had become evident that, at least for the three and a quarter million inhabitants of the metropolis, the severity of this epidemic of small-pox would be beyond any recent experience we had had of the disease.

THE SUPERVISION OF NUISANCES REMOVAL AND DISEASES PREVENTION AUTHORITIES.

Supervision of Nuisances removal and Diseases prevention Authorities.

During the year 1870 there were 200 cases where communication with local authorities was necessary in regard of questions of *common sanitary administration;* and in 66 of these cases the communication involved local inquiry by a medical inspector of the department. I subjoin (Appendix) a list of (*a*) the 66 cases in which inspectors' visits were made, and of (*b*) the 134 cases in which the communication was by letter; and this list shows compendiously on what ground in each case the department had to intervene.

It will be seen, on reference to the table, that almost invariably the matter calling for inquiry was the local prevalence of some dangerous infectious disease. It deserves notice that in the greater number of cases the local prevalence of disease became known to this department through the more detailed enumeration of deaths which the Registrar General now gives every three months, for each sub-district of England, in the admirable new series of his Quarterly Returns; and I am the more glad to point to this illustration of the utility of the detailed Returns, because it justifies the opinion which I expressed two years ago, that if such an extension could be given to the Returns, "the quarterly publication " would represent one of the most important aids which could " be rendered to the health-administration of the country."

As regards the 66 cases, where it was practicable to send a departmental inspector to the locality, the first division of the table exhibits in its last column, as briefly as possible, the conditions which in each case the inquirer found existing: conditions, in no case satisfactory, and very rarely other than of the grossest local neglect. I think it probable that the conditions, which this first division of my table exhibits with regard to the 66 inspected localities, would have been found in very large proportion in the 134 other localities, if the departmental inspection could have extended thither.

The inadequacy of the present staff of this department to supervise the local administration of the Diseases-Prevention and Nuisances-Removal laws, and to meet (or even nearly to meet) by medical inspection the demands which are made by local outbreaks or apprehensions of dangerous infectious disease, became in 1870 extremely evident: as may here already have been inferred from the fact that inspectors visited only a third part of the number of cases where communication with local authorities was necessary: and the inadequacy would have been far more evident, were it not that, in our entire lack of public returns of (not fatal) sickness, the field where sanitary supervision is needed remains in one large part of its extent shut out of view. In these circumstances the Lords Commissioners of the Treasury approved that the Estimates (now before Parliament) for the financial year 1871–2 should include a proposal to increase the staff of this department; and the increase which is proposed, if it has the sanction of Parliament, will so far diminish the above-described defect as to enable a large part of the country to be under fair sanitary supervision.

AUXILIARY SCIENTIFIC INVESTIGATIONS.

Auxiliary scientific investigations.

The *pathological work* of the department was in 1870 carried on in its two branches, as described in my last year's report, by Dr. Sanderson and Dr. Thudichum respectively. In neither of the two branches of investigation is the matter of study such that results can easily be published in fragments; and on the present occasion I think it better, as regards one of the branches, not to submit the results of 1870 till they can be extended by the present year's work. But as regards the other, I am able to lay before your Lordships the subjoined report by Dr. Sanderson (Appendix) in continuation of his studies of the process of contagion; and I am glad to state, on the evidence of this report, that, even at the present very early stage of work, Dr. Sanderson's investigation is giving results which are of direct interest to the practice of medicine and surgery.

Conclusion.

At the present date, when according to Statute the departmental proceedings of 1870 must be reported to your Lordships, the proceedings from day to day are such as to leave little opportunity for retrospect. An epidemic of small-pox, greatly more severe than any in the last 30 years, is prevailing throughout this metropolis; while at the same time, in virtue of an engagement made in the last Session of Parliament, a Select Committee of the House of Commons, appointed for the purpose, is taking evidence as to the working of the Vaccination Act of 1867, and as to the value of various objections which have been agitated against the practice of vaccination. These exceptional circumstances, with the large daily claims which they of course make on the staff of this department, forbid my dealing in the present report with any subject-matter which can properly be postponed. And having above laid before your Lordships, as the Statute requires, my summary of the work of 1870, I find only one further matter which in my opinion is at once so important and so urgent that, even now, I must submit it for your consideration.

I refer namely to the extremely unsatisfactory state of the laws which concern the general sanitary administration of the country: a subject, concerning which I two years ago submitted the chief facts to your Lordships, and on which the Royal Sanitary Commission has recently made its final report.

I would beg leave to represent to your Lordships that the unamended state of those laws, especially as regards the constitution of local authorities and the powers which they ought to have and exercise for the prevention of disease, is not only an extreme difficulty and discouragement to persons engaged in sanitary administration, but also involves a large and constantly-increasing waste of human life; and that since the resources which might be utilised for the better protection of life are also with the progress of knowledge constantly increasing, so, almost month by month, the contrast becomes more and more glaring, between the little which is done and the very much which with amended law might be done, to reform the sanitary circumstances of the masses of our population.

I believe that your Lordships will deem this matter to be, in various points of view, deserving of the particular notice of Parliament.

In the first place, there is the largeness of the continuing waste of human life. It seems certain that the deaths which occur in this country are fully a third more numerous than they would be if our existing knowledge of the chief causes of disease were reasonably well applied throughout the country; that, of deaths which in this sense may be called preventable, the average yearly number in England and Wales is now about 120,000; and that of the 120,000 cases of preventable suffering which thus in every year attain their final place in the death-register, each unit represents a larger or smaller group of other cases in which preventable disease, not ending in death, though often of far-reaching ill-effects on life, has been suffered. And while these vast quantities of needless animal suffering, if regarded merely as such, would be matter for indignant human protest, it further has to be remembered, as of legislative concern, that the physical strength of a people is an essential and main factor of national prosperity; that disease, so far as it affects the workers of the population, is in direct antagonism to industry; and that disease which affects the growing and reproductive parts of a population must also in part be regarded as tending to deterioration of the race.

Then, my Lords, there is the fact that this terrible continuing tax on human life and welfare falls with immense over-proportion upon the most helpless classes of the community; upon the poor, the ignorant, the subordinate, the immature: upon classes, which in great part through want of knowledge, and in great part because of their dependent position, cannot effectually remonstrate for themselves against the miseries thus brought upon them, and have in this circumstance the strongest of all claims on a Legislature which can justly measure, and can abate, their sufferings.

There are also some indirect relations of the subject which seem to me scarcely less important than the direct. For, where that grievous excess of physical suffering is bred, large parts of the same soil yield, side by side with it, equal evils of another kind; and your Lordships will often have seen illustrated in my reports, that, in some of the largest regions of insanitary influence, civilisation and morals suffer almost equally with health. At the present time, when popular education (which indeed in itself would be some security for better physical conditions of human life) has its importance fully recognised by the Legislature, it may be opportune to remember that, throughout the large area to which these observations apply, education is little likely to penetrate unless with amended sanitary law, nor human life to be morally raised while physically it is so degraded and squandered.

The above various considerations, taken together, seem to me to invest the subject which I am bringing under your Lordships' particular notice with a degree of national importance to which very few subjects can pretend. Its relative position among such subjects is not a point on which I would presume to speak. But, considering the trust which is reposed in my office with regard to this great national interest, I cannot in too strong terms express my official knowledge that it most urgently needs the attention of the Legislature. And I venture to hope and believe that your Lordships' full cognisance of the case will lead you to accord to that conclusion your authoritative sanction and furtherance.

From the Statement contributed in 1872 to the First Report of the Local Government Board.

[It is necessary to explain that until August 14th the Medical Department was still under the Privy Council. The statement contains a Section relating to Public Vaccination, which has appeared in Vol. I., pp. 393–407, and a Section relating to Cholera.—ED.]

CHOLERA.

A second exceptional business of the medical department in the year 1871 depended on there being again in the summer some alarm of Asiatic Cholera. Having for nearly two years been in Russia, and since August 1870

Cholera.

more or less in St. Petersburg, the disease in the spring and early summer of 1871 spread somewhat considerably in the Baltic provinces of Russia, and at the end of July began to touch the contiguous parts of Germany, where soon afterwards Königsberg suffered most severely. With cholera actually epidemic at St. Petersburg, Cronstadt and Riga, and likely soon to become epidemic at ports still nearer to England, it was evident that ships from the Baltic might in certain cases be a source of danger to this country.

As England has for many years accepted the view that in her case strict quarantine, centrally administered, cannot be made the means of excluding dangers of that sort, and as in consequence the defences which she can use against cholera on the continent of Europe are substantially only such as local authorities are respectively empowered to apply against the ordinary contagia of their own districts and neighbourhoods, so the steps which Government had to take in view of the fact of cholera in the Baltic were mainly these:—to warn local authorities (and especially port-authorities) of the danger in question; to advise them of the precautions which in the present state of knowledge are regarded as of most value against the infection of cholera; and to see that every legally possible facility was given for the local exercise of such precautions. On July 29th the Lords of the Council issued an Order, and on August 3rd and 5th other Orders, designed to facilitate the examination of ships arriving from the Baltic, and generally, in relation to such ships, the action of local authorities under the provisions of the Sanitary Act, 1866; while also, by their Lordship's direction, I issued for general public use a memorandum of precautionary suggestions concerning cholera: of which Orders and Memorandum copies are subjoined [A]. Further, since local authorities, into whose districts cases of sea-borne cholera might be imported, could take no useful action in the matter except in proportion as they had previously provided suitable hospital-accommodation for such cases, and since there was reason to fear that authorities were hitherto scarcely at all exercising the power given them for provision of hospitals, the chief port-authorities of England had to be

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addressed on this subject, and in most instances the ports were visited by an inspector of the department, instructed to confer with the authorities. I subjoin (Appendix) a tabulated list of the 48 port-visitations which were made, chiefly by Mr. J. N. Radcliffe, for this purpose; with note in the list where the advice given included points special to the locality, and with abstract of the arrangements afterwards adopted by the several authorities.

At the time when these arrangements were first recommended, the danger was comparatively remote, in the sense that any sailor or passenger who had caught cholera in some Russian port of the Baltic would probably have ended the infectious stage of the disease in death or convalescence before the arrival of his ship in English waters; but afterwards, as more westerly ports in succession got infected, including (early in September) Hamburg and Altona, the chances were greatly increased, not only that ships might arrive having had cholera on board, and with bedding and other things in need of disinfection, but also that an occasional patient at the height of the disease, and pouring forth infective discharges, might be brought on shipboard into some English port; and it was therefore very satisfactory to know that, almost universally, fair provision for any such casualties had been made. The cases in which port-authorities actually had to treat particular ship-arrivals as infectious were, I believe, very few; almost universally they were cases where death from cholera had taken place during the transit; and I know only of a single case (namely at Hartlepool) where the authority had to receive into hospital a cholera patient brought living into the port.

Lest, however, this fact should seem to suggest that the local provision of hospitals was unnecessary, several other considerations have to be borne in mind: first, that any single cholera patient, landed without proper precautions, might have started an epidemic of cholera, capable of indefinite extension in and from the place of his arrival; secondly, that at the present date cholera is still prevailing in the Baltic ports of Russia, and may, some weeks hence, when the Baltic traffic re-opens, become of at least as much

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concern to us as six months ago; thirdly, and not least, that irrespectively of cholera, and because merely of the frequency with which cases of common infectious fevers are brought by ships into English ports, each port was previously in need of ready hospital-accommodation for a few such cases, and the accommodation provided for cholera is, in the absence of cholera, available for those other diseases.

In connexion with the present mention of cholera, I think it necessary to point out that the disease, as now prevailing in Russia, probably represents circumstances of considerable new danger to the public health of Europe. Mr. J. N. Radcliffe, who of late years, with much epidemiological learning, has noted minutely for this department the various steps of cholera migration from Asia, draws my attention to the fact that recent developments of traffic to the south of the Caucasus have already brought Persia into such easy and frequent communication with the Euxine, as virtually to have established a new route for the migration of Asiatic cholera into Europe: by which route he thinks it highly probable that the present infection of Russia was effected; and in the same sense, but prospectively, Mr. Radcliffe refers with apprehension to the probable influence of the line of railway, now soon to be partly opened, from Baku on the Caspian to Poti on the Euxine. It is of course an obvious and serious consideration, that, in proportion as movement becomes quicker towards the great markets of Europe from the constantly infected pilgrimage resorts of Persia and India, there is withdrawn one of the protective conditions which have hitherto made cholera so exceptional in Europe.

Local inquiries into Sanitary Administration.

I subjoin [A] a tabular description of the 55 local inquiries which the inspectors of the department made during the year in matters of general sanitary administration. Of these inspections, five related to questions of voluntary hospital-accommodation to be provided under section 37 of the Sanitary Act, 1866; but the remaining 50 related to defaults of the local sanitary authorities in matters of statutory obligation, and for the most part to outbreaks of epidemic disease which these defaults, existing often

Local inquiries into Sanitary Administration.

to the most scandalous extent, had occasioned. In addition to the above there were 86 cases where local epidemics were brought under notice of the department, or complaint was made of local circumstances likely to produce disease, but where (though in many cases a medical inspector's visit would have been desirable) inquiry and advice could only be by correspondence.

LOCAL GOVERNMENT BOARD REPORTS,
1874-1876.

[The following Reports are given in full. They relate specially to the most urgent questions of the time, viz.: the relations of the Local Government Board to Local Sanitary Authorities and the relationship of the Medical Department to the Local Government Board. They also relate to the System of Public Vaccination; the Prevention of Small-pox in England; the Prevention of Diseases other than Small-pox; the prevalence of Asiatic Cholera in Europe; Filth Diseases and their Prevention; Studies of Nuisance Prevention; the International Sanitary Conference at Vienna; the International relations of Asiatic Cholera. The Scientific Investigations were carried out under the Privy Council and the Reports are therefore grouped together and follow the Local Government Board Reports.—Ed.]

LOCAL GOVERNMENT BOARD REPORTS, 1874-1876.

Annual Report of 1874.*

TO THE RIGHT HONOURABLE THE PRESIDENT OF
THE LOCAL GOVERNMENT BOARD,
&c. &c. &c.

SIR,

As the officer appointed to make report to the Local Government Board, for the annual information of Parliament, in relation to matters concerning the Public Health, and to the inquiries and other proceedings which the Board, under the Public Health Act, 1858, may have directed in such matters, I beg leave to submit to you that for the past two and a half years, and particularly during the last year, the circumstances of official and administrative transition, consequent on the Acts of Parliament of 1871 and 1872, have been such that no consistent scheme of report in general relation to the sanitary interests which are under the Board's superintendence has been possible to me; and the present Report, which regards the year 1873, must necessarily, even more than its two predecessors, illustrate the difficulty of the unsettled circumstances.

Appointment of Medical Officers of Health under the Act of 1872.

2. Of the Board's business during the year 1873 in matters of concern to the Public Health, the largest and incomparably the most important part was that which related to the action of local sanitary authorities under the Act of 1872 in appointing their Officers of Health and Inspectors of Nuisances. This action, which the Legislature, at the instance of the Royal Sanitary Commission, had made obligatory on all the local authorities, and which included as its most important feature

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* Reports of the Medical Officer of the Privy Council and Local Government Board, New Series, No. I.

that for the first time the Medical Profession throughout the country was to be brought into official use with a view to the better prevention of disease, was, at least in part, even in the terms of the statute, tentative*; and evidently the discretion to be used by each authority in its compliance with the terms of the law would, for better or worse, be of great future consequence to the local working of the Sanitary Acts, and to eventual public estimation of the new machinery. The Board throughout the year 1873 was advising local authorities in detail on particular schemes of appointment and duty for the above-mentioned sanitary offices; but this branch of business was exclusively in the hands of the non-medical officers of the Board, and I therefore do not here attempt to give any account of the proceedings or their results.

Medical Inspections in regard of local sanitary questions.

3. Of the medical inspections which were made during 1873 in regard of local sanitary questions, and which under the peculiar circumstances of the year were but 42 in number, I subjoin a detailed list [A]. In one of them the inspection related to a question of hospital-accommodation, and in one to certain manufacturing processes causing nuisance to several districts; but otherwise universally the ground of inquiry was some more or less important presence of disease; and the last column of the subjoined table will enable some judgment to be formed as to the extent to which the powers of the authorities had been exercised, and the duties fulfilled, in the particular instances referred to. I may add that, as some of these local inquiries were in cases of much sanitary interest, I propose bringing their results before you, as soon as practicable, in a separate supplementary report.

Comparisons in the sanitary conditions under which certain industries carried on.

4. One considerable inquiry, of a sort different from the above, was in progress during part of the year, but has not hitherto been completed. It has in view to examine the

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* In regard of rural sanitary districts the first appointments of medical officers of Health and Inspectors of Nuisances under the Act must be for a period not exceeding 5 years.—J.S.

sanitary conditions under which certain industries are now carried on, as compared with the lung-diseasing conditions which existed in 1860–64, when special report on them was made to the Privy Council; and I have to state that during 1873 contributions towards the making of that comparison were furnished in inquiries of the Medical Department as follows: by Dr. Ballard in respect of metal trades at Sheffield, Wolverhampton, Alcester, Bromsgrove, and Birmingham; by Dr. Blaxall in respect of glove-making at Yeovil; by Dr. E. Smith in respect of tailoring and printing in London; by Dr. Thorne in respect of pillow-lace manufacture at Newport and Towcester, of machine-lace and hosiery manufacture at Nottingham, Radford, and Basford, of straw-plaiting at Tring and Berkhampstead, of silk-weaving at Leek, of silk-weaving and watch-making at Coventry, and of hosiery manufacture at Leicester and Hinckley.

Public Vaccination.

5. The business of the Board as to vaccination in 1873 regarded, as usual, the following matters:—(*a*) the proceedings of local authorities and officers under the Vaccination Acts; (*b*) the provisions by which the national supply of vaccine lymph is maintained; and (*c*) the arrangements which give effect to the Order of Council regulating the qualifications of public vaccinators. (*a*) In superintendence of local proceedings under the Vaccination Acts, the Medical Department inspected 1,617 vaccination-districts in 354 Unions or parishes: each district-inspection involving, first, an inquiry into the state of vaccination in the district; secondly, where requisite, a notification to the authority as to defects found in the local administration of the Acts, with advice as to the changes required; and thirdly, in suitable cases, a recommendation of the vaccinator for pecuniary award, under section 5 of the Vaccination Act, 1867, out of moneys voted by Parliament for the purpose, and of which in 1873 an amount of 8,508*l.* 17*s.* 4*d.* was thus distributed. Particulars of the vaccination-inspections of 1873, and of the awards made to public vaccinators, are subjoined [A]. (*b*) Acting as National Vaccine Establishment, the Medical Department supplied vaccine lymph in answer to

9,569 applications. Particulars as to the sources whence this lymph was derived, and as to the applicants who received it, are given, with other statistics of the National Vaccine Establishment [A]. The stations supplying lymph for the public service were as usual specially inspected. (*c*) The several educational vaccinating stations, established with reference to the Order of Council which regulates the qualifications of public vaccinators, require in this relation to be inspected on behalf of the Board, and were, as usual, so inspected in 1873; but as they are for the most part stations which also supply lymph for the public service, and as the efficiency of a station for the latter purpose greatly concerns its efficiency for the former, the inspection of them in the one relation conveniently combines with inspection of them in the other, and in practice the two objects are attained in single inspections.

Prevalence of Asiatic Cholera in Europe.

6. Lastly, I have to report that in 1873, and particularly during much of the second half of the year, Asiatic cholera was more or less prevalent in many parts of continental Europe, and sometimes—as at Paris, Havre, Rotterdam and Antwerp—in places which have constant and easy communication with England. In our relations to cholera on the continent of Europe there are at present some points of interest on which I may have occasion to submit to you a supplementary report: but I need not here do more than refer to the Board's actual proceedings as to cholera during the year on which I am reporting. In July 1873, in view of the then circumstances, the Board issued (instead of an Order which had been issued in 1871 by the Lords of the Council) an amended Order, prescribing rules for the detention and examination of ships suspected of choleraic infection, and for dealing with cases of actual infection [A]. The Board also circulated among the local sanitary authorities of England a memorandum [A] which at the Board's desire I had prepared, on the precautions generally proper for local adoption under the circumstances; and particular communications on the subject of local arrangements were also had by the Board with several of the sanitary authorities of

ports. In a few cases, namely, three times in the Thames, twice at Liverpool, once at Southampton, and at least once at Swansea, the local arrangements were tested by infectious arrivals; and in most of these cases, as well as in several instances of false alarm, local inquiry was made by inspectors from the Medical Department: Dr. Buchanan, Mr. Radcliffe, Dr. Gwynne Harries, and Mr. Power.*

The above account refers, as I have stated, to a period of official and administrative transition, during which it is impossible to represent the Local Government Board as directing inquiries under the Public Health Act, 1858, in any definite relation to the new sanitary system of the country; but with the end of the year 1873, that period of transition may be deemed to have nearly accomplished itself; and I may hope that, before the next season arrives for the submission of the Annual Report under the Act of 1858, it may have become possible to begin in a really useful sense such new succession of reports as the changed conditions of sanitary administration seem henceforth to require.

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* In one case, among those which particularly concerned London, the danger was extremely great. On the 28th July, a ship from Hamburg landed at Blackwall a body of 82 Danish and Swedish emigrants, in destination for New Zealand. During the voyage no sort of illness, except sea-sickness, had been noted among them, and therefore no objection to their landing had been raised under the Board's recent Order; but almost immediately afterwards, when to await re-shipment, they had settled themselves in various lodging-houses in Whitechapel, and were legally in the position of ordinary residents in London, it became evident that cholera was among them; and the Board's first information of this state of the case was due to the courtesy of a private medical practitioner who had been called to the sick. As soon as his letter was received by the Board, communication on the subject was had by the Medical Department with the authorities and others who were concerned, and by great exertions of all, under a state of law in which everything depended on voluntary exertions on one side and absence of objection on the other, the emigrants by 31st July (the day on which they were to have been re-shipped for New Zealand) were collected and placed in isolation on the port authority's hospital-ship "Rhin" off Gravesend, to remain there under medical care. Then the houses where they had been temporarily lodged, and which meanwhile had been under close observation by the Whitechapel officer of health, Mr. Liddle, were finally disinfected. Of the 82 emigrants, 28 sickened and 8 died; but to our own population there was no extension of the disease. The removal was managed by the emigration agent, to whom the great importance had been explained of getting all the emigrants together into suitable quarters where their state of health could be medically watched and cases of incipient cholera be isolated; but this action, taken by him with the co-operation of the recently appointed able health-officer of the port, Mr. Harry Leach, was without any support from law. That he was able to do as advised, and to do it in such a way as to transfer an immense danger from the heart of London to a comparatively safe distance, was due to the goodwill of the port-authority, who made their Gravesend ship available for the relief of Whitechapel; and it seems to me that by acting in that liberal spirit the Corporation of the City helped London out of a serious difficulty. Dr. Buchanan, assisted in part by Dr. Gwynne Harries, was the inspector who visited in this important case.—J.S.

The Local Government Board as a Central Board of Health.

If, in that hope, I may venture to indicate from beforehand the purposes which it seems to me the reports under the Act of 1858 must in future be expected distinctively to fulfil, I would say that, whatever else they may be expected to do, at least they must be expected to set forth the knowledge which the Board, through its department of sanitary inquiry, obtains, with regard to the *practical effect of the laws which are in force for the prevention of disease throughout England.* It is the common conviction of persons who have most studied the subject, that the deaths which occur in this country (now about half a million a year) are by fully a third part more numerous than they would be if existing knowledge of the chief causes of disease were reasonably well applied throughout the country; and I need hardly add that, if thus some 125,000 cases of preventable suffering annually attain their final record in the death-register, that vast annual total has the terrible further meaning that each unit in it represents an indefinite (often very large) other number of cases, in which preventable disease, not ended in death, though often of far-reaching ill-effects on life, has also during the year been suffered. The Local Government Board, viewed as a Central Board of Health, and the more than fifteen hundred District-Authorities which, each with its appointed Medical Officer of Health, locally administer the health-laws, may be regarded as having had their respective functions assigned to them in special and systematic relation to that state of things; and it will be peculiarly with regard to that relation, namely, as rendering account of the central share of the responsibility, that the future Annual Reports of the holder of my office will, I apprehend, have their essential meaning.

In the sanitary administration of England, there are certain prescribed cases (chiefly in regard of local powers of rating, mortgaging, and bye-law making) where the local action cannot be taken without previous express approval of the Central Authority; and no doubt the central authority, in its exercise of that responsibility, has often been able to influence very advantageously the course which Local Authorities have proposed to take. Also it possesses, in supposed reserve for great epidemic emergencies, a power to issue directions for certain purposes under the Diseases Prevention Act, 1855. But with exception of such special cases, the function of the Central Authority in regard of local sanitary action is primarily one of mere observation and inquiry. Not itself authorised to interfere in such action except where the results are at fault, it watches and interrogates results; and it is distinctively in this relation to the sanitary interests of the country that the Local Government Board will be represented by its ordinary proceedings under the Public Health Act, 1858. For the eventual test of local sanitary administration will be the success with which it prevents disease; and, in each case where the preventable disease is not prevented, the Local Government Board can, by skilled inspection under the Public Health Act, 1858, satisfy itself as to the circumstances and causes of the failure: giving thereupon such skilled advice, or proceeding in certain extreme cases to issue (under § 49 of the Act of 1866 or under the Diseases Prevention Act) such orders and directions, as the particular occasion may require.

What standards of success in Disease-Prevention ought to be taken as satisfactory by the local authorities which now have to act in that matter, and by the central authority which has to superintend their action, is a question on which I need not here submit more than very few general observations. Our large annual total of preventable deaths receives probably from most or all of the fifteen hundred sanitary districts of the country contributions, larger or smaller, which in their respective degrees are evidences of sanitary unsuccess; and I would therefore point out, as of very important bearing on the whole tone of sanitary administration, that, in the death-accounts which have henceforth to be critically examined by both Central and Local Authorities, figures which arithmetically make but little show may, for administrative purposes, have immense meaning. One or two deaths by enteric fever, noted in a Quarterly Return of the Registrar-General in regard of some village or small country town, may in hundreds of instances correspond to long-continued local conditions of scandalous filth and unwholesomeness: one or two deaths by scarlatina or small-pox, almost unnoted in regard of some considerable town, may represent the beginning of what, three months later, will be a terrible epidemic, agitating the community with distress and fear, and adding prodigiously to the whole year's death-rate of the place; and it is with reference to considerations like these, that records of even single deaths will now have to be medically read and interpreted. In regard of such epidemic visitations as are aptest in this country to excite local alarm, and to be felt as conclusive appeals for central interference, it may appear a mere truism to say that, in proportion as the disease is present, the time for preventing it is past: but for practical purposes it is indeed all-important to remember that sanitary administration has its hopes of success in preventing, not in arresting, great epidemics; and that, if warnings are not taken from the smaller excesses of disease, catastrophes, not further warnings, may be next to come. It seems almost unnecessary to add that a method of procedure which waits for death as its ground of action may peculiarly dispense with cumulative proofs; and that, as no one preventable death can any longer be remedied in regard of him who has suffered it, so the record of it may the more emphatically claim to be read as a protest on behalf of others.

The vigilance which the Local Government Board has to exercise in regard of the local prevention of disease in England will of course not universally need to express itself in the form of inspections. As regards the Board's giving of advice or assistance to local sanitary authorities and their officers, clearly this would be limited, first, by the fact that, unasked, it could not properly have place except where the local results showed need for it; and secondly, by the consideration, that, in the large and permanent interests of sanitary government, a maximum of local self-reliance and a minimum of central intervention are in themselves important aims. And even as regards mere inquiry into the facts of what is locally going on, correspondence (often bringing in the reports of local officers) will in some cases afford the Board all adequate information for its purpose.

On the other hand, and provided due regard be had to the above considerations, the advantage which may be gained to the sanitary progress of the country by inspections conducted, at least for many years, on a sufficiently large scale, under the Public Health Act, 1858, can hardly, I think, be overestimated. It has, I believe, been the experience of the Local Government Board in those branches of its administration which do not concern the public health (as particularly in its poor-law and common municipal business) that the personal agency of Inspectors of the Board, as distinguished from mere inquiry and advice by letter, is, in a very large proportion of cases, essential to the success of the work: first, in order that the Board may competently understand the local conditions or proceedings which it desires to judge; and secondly, in order that, in a degree and with an effect which no letter-writing can attain, it may make to the local authorities with which it has concern precisely such representations, and may give them precisely such advice, as the particular local circumstances require. The Board would probably not expect experience of a different kind in its future, essentially medical, province of sanitary superintendence; and indeed, as regards this province, my own experience enables me to say with certainty that it is peculiarly one in which clerical, as compared with inspectorial agency, would show itself inadequate to the purpose. By skilled inspections under the Public Health Act, 1858, on such a scale as practically to represent a central audit of local death-accounts, and an exertion of central influence or authority in favour of more active or better-directed local efforts in places where human life had not been sufficiently cared for, the Local Government Board would be in reality, though only in the limited sense which the law prescribes, a Board of Sanitary Superintendence for England.

Briefly then, as regards the Annual Reports to be hereafter made under the Public Health Act, 1858, the state of the case, as I apprehend it, will be this. The Local Government Board will from time to time determine what degree of central vigilance as to the local prevention of disease shall be represented by its proceedings under the Act, and will regulate in accordance with such standard of work the staff by which the work has to be executed. It will be for the holder of my office annually to lay before the Board a report of the proceedings so taken: substantially a report on the new sanitary administration of the country, as examined by the Board from the standpoint of results; and which, so far as means for it exist, would aim at exhibiting, for the information of Parliament, what, year by year, are the chief existing excesses of disease in the several sanitary divisions of England, and what the relation of such excesses to insufficiencies of law or administration. Incidentally to the above, which I have regarded as the essential business of future annual reports under the Act, it would probably be of advantage to the public service that the reporter should use the same annual opportunity for submitting to the Board, with a view to publication, such new knowledge as the Medical Department might during the past year have acquired with reference to the prevention of disease, and such new memoranda of advice on sanitary subjects as the growing experience of the Department might be held to justify.

From among the many points of local relation which the Board's sanitary superintendence must include, there is one which in conclusion I will specially mention: not indeed without confessing that, in love and honour for my own profession, I regard it with warm personal interest; but believing that I may, nevertheless, without partiality describe it as of fundamental interest to the working of the scheme of recent legislation. While watching, from the point of view of results, the action taken by local authorities throughout England for the better prevention of disease, the Board will be superintending the exact province of work for which the respective local authorities under the Act of 1872 are required to appoint their Medical Officers of Health; and the inspections under the Public Health Act, 1858, will therefore, so far as they extend, give the Board knowledge of the working of that new institution in the various forms in which it is being tried throughout the country, and in which, in regard of about half the number of cases, the trial is with the Board's part-payment and particular responsibility. Such inspections, too, as bringing the Board's Medical Department into direct relation with the local Officers of Health, and giving the Department opportunity to contribute any assistance in its power to the success of the local institution, will, where they extend, represent an object which the Royal Sanitary Commission, in making the recommendations on which the Public Health Acts of 1871 and 1872 were founded, put forward as an element of their scheme. As regards that intention of the Royal Sanitary Commission, I need hardly say that, to any holder of my office, it must always be among the highest of ambitions to be able to see the experience of this Department really conducive to the information and influence of younger fellow-labourers in other parts of the same great field of public service; and it would be affectation in me to deny that, during many early years of the new organization, relations in that sense between the central and local services may often be of important, and sometimes of indispensable, use to the latter. I would, however, also express my confident expectation that, though from the nature of the case the relation in these earlier years must chiefly consist in assistance which the central office can so render, succeeding years will more and more bring the central office under obligation to local contributors of knowledge, and to local illustrations of progress. And year by year it will surely grow to be among the most useful, as it must also be among the happiest, duties of the Annual Reporter under the Public Health Act, 1858, to represent, for the information of all the Officers of Health of the kingdom, such additional fruits of scientific observation, and such new evidences of practical success, as will have come to the Board's knowledge from among their number.

I have the honour to be,
Sir,
&c., &c.

[The following Cholera Memorandum is the last issue of an official memorandum which in earlier forms had been issued by Mr. Simon in 1866 and 1871.—Ed.]

Appendix No. 5.

Memorandum on Precautions to be taken against the Infection of Cholera.

Precautions against Cholera.

1. As Asiatic Cholera is now prevailing in parts of the Continent of Europe, and may probably extend (or perhaps has already extended) to places which are in frequent and rapid communication with England, it is not unlikely that, within the next month or two, cases of the disease may be brought into the ports of this country.

2. The Order, now about be issued, of the Local Government Board will give power to local Sanitary Authorities to deal with any such cases, if they arrive, in a way to protect the population, as far as practicable, against surprise. But as cases of choleraic infection have widely different degrees of severity, it is possible that some such cases, slightly affected, will, notwithstanding the vigilance of local Authorities, be landed without particular notice in English sea-board towns, whence then they may advance to other, and perhaps inland, places.

3. Former experience of Cholera in England justifies a belief that the presence of imported cases of the disease at various spots in the country will not be capable of causing much injury to the population, if the places receiving the infection have had the advantage of proper sanitary administration; and, in order that all local populations may make their self-defence as effective as they can, it will be well for them to have regard to the present state of knowledge concerning the mode in which epidemics of Cholera (at least in this country) are produced.

4. Cholera in England shows itself so little contagious, in the sense in which small-pox and scarlatina are commonly called contagious, that, if reasonable care be taken where it is present, there is almost no risk that the disease will spread to persons who nurse and otherwise closely attend upon the sick. But cholera has a certain peculiar infectiveness of its own, which, *where local conditions assist*, can operate with terrible force, and at considerable distances from the sick. It is characteristic of Cholera (and as much so of the slightest choleraic diarrhœa as of the disease in its more developed and alarming forms) that *all matters which the patient discharges from his stomach and bowels are infective.* Probably, under ordinary circumstances, the patient has no power of infecting other persons except by means of these discharges; nor any power of infecting even by them, except in so far as particles of them are enabled to taint the food, water, or air, which people consume. Thus, when a case of Cholera is imported into any place, the disease is not likely to spread, unless in proportion as it finds, locally open to it certain facilities for spreading by *indirect infection.* In order rightly to appreciate what these facilities must be, the following considerations have to be borne in mind:—*first,* that any choleraic discharge, cast without previous thorough disinfection into any cesspool or drain, or other depository or conduit of filth, infects the excremental matters with which it there mingles, and probably, more or less, the effluvia which those matters evolve; *secondly,* that the infective power of choleraic discharges attaches to whatever bedding, clothing, towels, and like things, have been imbued with them, and renders these things, if not thoroughly disinfected, as capable of spreading the disease in places to which they are sent (for washing or other purposes) as, in like circumstances, the

Precautions against Cholera.

patient himself would be; *thirdly*, that if, by leakage or soakage from cesspools or drains, or through reckless casting out of slops and wash-water, any taint (however small) of the infective material gets access to wells or other sources of drinking-water, it imparts to enormous volumes of water the power of propagating the disease. When due regard is had to these possibilities of indirect infection, there will be no difficulty in understanding that even a single case of Cholera, perhaps of the slightest degree, and perhaps quite unsuspected in its neighbourhood, may, *if local circumstances co-operate*, exert a terribly infective power on considerable masses of population.

5. It might be supposed that, under those provisions of the Sanitary Acts which relate to precautions against dangerous infections of disease, security could be taken, as regards the infective discharges of Cholera, against various kinds of personal conduct which would be dangerous to the public health; above all, that, under those provisions or otherwise, the universal disinfection of such discharges could be enforced. Undoubtedly everything possible in this direction ought to be done wherever a case of Cholera is known to exist: too much importance cannot be attached to the precaution of thoroughly disinfecting, without delay, all discharges from the stomach and bowels of persons suffering under the disease, and of disinfecting, or destroying all bedding, clothing, towels, and the like, which such discharges may have imbued: and of course neither choleraic discharges, nor any slops which may contain traces of them, should ever (even when supposed to be disinfected) be cast into any position from which they may get access into drinking-water. But, although the duty of observing those precautions is one which ought never to be neglected, populations cannot prudently stake their lives on the chance that it will be completely fulfilled for them. Apart from all questions of negligence, the degrees of Cholera are too many, and the slight and incipient cases far too apt to escape observation, for any such defence against its infection to be more than partial. And therefore the main object for endeavour must be **TO SECURE EVERYWHERE SUCH LOCAL CIRCUMSTANCES THAT THE INFECTIVE MATERIAL, THOUGH NOT DISINFECTED, WOULD BE UNABLE TO SPREAD ITS INFLUENCE AMONG THE POPULATION.**

6. The dangers which have to be guarded against as favouring the spread of Cholera-infection are particularly two. First, and above all, there is the danger of WATER-SUPPLIES which are in any (even the slightest) degree tainted by house refuse or other like kinds of filth; as where there is outflow, leakage or filtration, from sewers, house-drains, privies, cesspools, foul ditches or the like, into springs, streams, wells, or reservoirs, from which the supply of water is drawn, or into the soil in which the wells are situate; a danger which may exist on a small scale (but perhaps often repeated in the same district) at the pump or dip-well of a private house, or, on a large and even vast scale, in the source of public waterworks. And secondly, there is the danger of breathing AIR which is foul with effluvia from the same sorts of impurity.

7. Information as to the high degree in which those two dangers affect the public health in ordinary times, and as to the special importance which attaches to them at times when any diarrhœal infection is likely to be introduced, has now for so many years been before the public, that the improved systems of refuse removal and water supply by which the dangers are permanently obviated for large populations, and also the minor structural improvements by which separate households are secured against them, ought long ago to have come into universal use.

So far, however, as this wiser course has not been adopted, temporary security must, as far as practicable, be sought in measures of a palliative kind.

Precautions against Cholera.

(*a*.) Immediate and searching examination of sources of water-supply should be made in all cases where the source is in any degree open to the suspicion of impurity: and the water both from private and public sources should be examined. Where pollution is discovered everything practicable should be done to prevent the pollution from continuing, or, if this object cannot be attained, to prevent the water from being drunk.

(*b*.) Simultaneously, there should be immediate thorough removal of every sort of house refuse and other filth which has accumulated in neglected places; future accumulations of the same sort should be prevented; attention should be given to all defects of house-drains and sinks through which offensive smells are let into houses; thorough washing and lime-washing of uncleanly premises, especially of such as are densely occupied, should be practised again and again.

(*c*.) Disinfection should be very freely and very frequently employed in and round about houses, wherever there are receptacles or conduits of filth; wherever there is filth-sodden porous earth; wherever anything else, in or under or about the house, tends to make the atmosphere foul.

In the absence of permanent safeguards, no approach to security can be got without incessant cleansings and disinfections, or without extreme and constant vigilance against every possible contamination of drinking-water.

8. In view of any possibility that the infection of Cholera may again be present in this country, it is desirable that in each locality the public should ascertain to whom it practically has to look, in case of need, for its collective safety against such dangers as the above. The responsibility is, in a large proportion of cases, mixed. The most critical of all its branches, the responsibility of providing for the unpollutedness of water-supplies, is, in many very important places, in the hands of commercial companies; and it is to be hoped that these companies, informed, as they must be, of the calamitous influence which some of their number have exerted in previous epidemics of Cholera, will remember, if the disease shall again be present here, that each of them, in its daily distribution of water, has hundreds, or even thousands, of human lives in its hands. But, except to that extent, the responsibility for local defences against Cholera, both as regards water-supply and as regards local cleanliness and refuse removal, is vested in the local Sanitary Authorities, Urban and Rural. These Authorities are all, by law, so constituted, as to represent, in their respective areas of jurisdiction, the will of the local rate-paying population; and each such population has had almost absolute means of deciding for itself whether the district which it inhabits should be wholesomely or unwholesomely kept. It is greatly to be wished that the former of these alternatives had, from long ago, been the desire of every local constituency in the country; and it may fairly be believed that, in considerable parts of the country, conditions favourable to the spread of Cholera are less abundant than at former times of visitation. But it is certain that in very many places the conditions of security are wholly or almost wholly absent; and it is to be hoped that in all this large class of cases, the Authorities, under present circumstances, will do everything which, in the remaining time, can be done, to justify the trust reposed in them by the Legislature for the protection of the public health.

9. It is important for the public very distinctly to remember that pains taken and costs incurred for the purposes to which this memorandum refers cannot in any event be regarded as wasted trouble and expense. The local conditions which would enable Cholera, if imported, to spread its infection in this country, are conditions which day by day, in the absence of Cholera, create and spread

other diseases: diseases, which, as being never absent from the country, are, in the long run, far more destructive than Cholera: and the sanitary improvements which would justify a sense of security against any apprehended importations of Cholera would, to their extent, though Cholera should never re-appear in England, give amply remunerative results in the prevention of those other diseases.

JOHN SIMON,
Medical Officer of the Board.

Local Government Board,
July 5th, 1873.

Supplementary Report of 1874.*

TO THE RIGHT HONOURABLE THE PRESIDENT OF THE LOCAL GOVERNMENT BOARD.

SIR,

IN my recent Annual Report, when adverting to the list which I then submitted of inspections made under you by this Department during the year 1873, I stated that some of the cases had been of so much sanitary interest that I would, as soon as I could, bring them more particularly under your notice in a separate Supplementary Report.

My reference was especially to three very instructive outbreaks of Enteric or Typhoid Fever which had been investigated within the year: but I find that with them I can advantageously associate two other of our departmental cases which have had an exactly similar interest; and I accordingly beg leave to draw your attention to the subjoined reports of the Inspectors by whom the five outbreaks were investigated.†

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* Reports of the Medical Officer of the Privy Council and the Local Government Board, New Series, No. II.

† Report by Dr. Blaxall on an outbreak of enteric fever in the town of Sherborne, Dorsetshire.
Report by Dr. Buchanan on an outbreak of enteric fever in Caius College, Cambridge.
Report by Dr. Ballard on an outbreak of enteric fever at Armley in the Borough of Leeds.
Report by Dr. Ballard on an outbreak of enteric fever at Moseley and Balsall Heath, near Birmingham.
Report by Mr. J. Netten Radcliffe and Mr. W. H. Power on an outbreak of enteric fever in Marylebone and the adjoining parts of London.

Enteric Fever, in regard of its mode of origin, seems to me the type of so vast a quantity of preventable disease as to claim, in an administrative point of view, the earliest and most vigilant attention of the Local Government Board. I therefore, at the opportunity of bringing the present special instances under your notice, and by way of preface to them, would submit to you some observations in which I have sought to embody the general experience of this Department with regard to Enteric Fever and the diseases which in preventability are most akin to it. I also annex, as of very valuable aid to the purpose of these observations, Mr. Netten Radcliffe's report of the results of a large inquiry, on which he has recently been engaged, with regard to that branch of local sanitary administration which is most concerned with the prevention of Enteric Fever.*

I have the honor to be, Sir,
&c., &c.

Filth-Diseases and their Prevention.

I.

1.—In the subject-matter of Preventive Medicine, considered with reference to the administrative needs of England at the present time, Enteric Fever, with the diseases which are allied to it in mode of origin, must necessarily, I think, stand as first topic: and I avail myself of this earliest opportunity to submit to the Local Government Board some observations on that class of diseases.

That very much disease is preventable, is the *raison d'être* of sanitary authorities.

2.—In my recent Annual Report, the vast amount of injury which is suffered day by day in this country through diseases well known to be preventable was referred to in regard of the responsibility which it imposes on all who have undertaken to serve in the new sanitary organisation of the country; and I submitted that "the Local Government Board, viewed as a " Central Board of Health, and the more than fifteen hundred " District-Authorities which, each with its Medical Officer " of Health, locally administer the Health Laws, may be " regarded as having had their respective functions assigned " to them in special and systematic relation to that state of " things."

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* Report by Mr. J. Netten Radcliffe on certain Means of preventing Excrement Nuisances in Towns and Villages.

Among the consequences of preventable disease, only the deaths can be counted.

3.—I do not pretend to give any exact statement of the total influence which preventable diseases exert against the efficiency and happiness of our population; for it is only so far as such diseases kill, and even thus far but very imperfectly, that the effect can be represented in numbers. Of the incalculable amount of physical suffering and disablement which they occasion, and of the sorrows and anxieties, the often permanent darkening of life, the straightened means of subsistence, the very frequent destitution and pauperism, which attend or follow such suffering, death-statistics, to which alone I can refer, testify only in sample or by suggestion.

Rough estimate of the mortality which is preventable:

4.—That the deaths which we in each year register in this country (now about half a million a year) are fully 125,000 more numerous than they would be if existing knowledge of the chief causes of diseases, as affecting masses of population, were reasonably well applied throughout England, is, I believe, the common conviction of persons who have studied the subject. The statistical considerations which in the first instance suggest that conclusion have so long and so admirably been put before the public in the successive Reports of the Registrar-General that I need but very briefly, and only by way of illustration, advert to them. Looking at England as a whole, we see that of each 100 persons who die, not quite 10 have reached the standard old age of seventy-five years; and that of each 100 children born hardly 74 complete five years of life. We next see what appears to be a widely different expectation of life in different districts of the country: that while, for instance, in a considerable proportion (about a seventh of the number) of the districts into which England is divided for registration-purposes, the death-rate of infants in the first year of life, ranges from 8 to 12 per cent., there is a still larger proportion of districts in which it ranges even from 19 to 30; and that, under the influence of these Herodian districts the infant death-rate of England as a whole stands at the high average of 18. Similarly, taking the death-rate of the population at all ages living, we find that the present general English death-rate of about 22½ per 1,000 per annum, covers on the one hand local death-rates ranging from 13 to 17, and on the other hand local death-rates which range even to far above 30. Primâ facie, then, it would seem that influences hostile to life must be operating in parts of England far more vehemently than in other parts; and we turn to the registered "causes of death" to learn from them, if we can, under what peculiarities of local assessment life is so differently taxed or mulcted in the different parts of this one country. Here of course we have to proceed with caution; for alleged causes of death may be registered on very imperfect non-medical testimony; and even medical certificates (since rapidly growing knowledge cannot be equally distributed in a very large and wide-spread profession) may in variable proportions be so inexact or arbitrary in their naming of the causes of death as to be unavailable for comparisons in this respect. With due caution, however, cases of this sort can be set aside, or the fallacies which they would introduce be guarded against; and when, with such caution, different districts are compared in regard of the causes of death registered in them, this finer sort of comparison adds very greatly to the force of the rougher comparisons which were first made; for, so far as the register of "causes of death" can intelligibly answer us, it says that certain sorts of disease—and those just the sorts which we in other ways know to be the most preventable, are very greatly more fatal in some districts of England than in others. This statistical conclusion, as based on the local death-returns which are made to the Registrar-General, was to some extent indicated by Dr. William Farr more than

30 years ago in the earlier annual reports of the General Register Office, and was afterwards more fully established and discussed in an important paper by Dr. Greenhow which I had the honour of laying before the General Board of Health in 1858.* From the passing of the Public Health Act of that year, the unequal distribution of different diseases in England became matter for detailed medical investigation and advice under the Privy Council; and in proportion as particular districts have been medically inspected with regard to the prevalence in them of the particular diseases to which attention had been drawn, so has evidence become more and more complete, with regard to the dependence of vast annual excesses of disease and death on causes which in the most moderate sense may be called removable.

preventable, namely, under action of law.

The causes of disease to which I here refer as removable are exclusively such as contravene Public Hygiene: such, namely, as affect more or less in common the mode of life of masses of population, and such as in most, if not in all instances, are already understood to be under ban of law. Doubtless much disease is also produced, and much life consequently wasted, through causes which are within the province of Private Hygiene; causes, which either are not of massive operation, or may at least easily be escaped at individual option, and which the law does not, and generally could not, take within its scope; but to such causes I do not advert as removable in the sense of my present argument.

Of removable causes of disease, the chief is uncleanliness :

5.—Among causes which injuriously affect the Public Health of England, considered as a total, certain operate only in particular districts: as, for instance, some large adjacency of malarious or water-logged land, or some prevalent injurious industry: while others, though no doubt in widely different degrees, appear to be of general, perhaps nearly universal, operation. Foremost in the latter class, and constituting therefore in my opinion objects which claim earliest attention in the sanitary government of England, two gigantic evils stand conspicuous :—

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* "Papers relating to the Sanitary State of the People of England: with an Introductory Report by the Medical Officer of the Board on the Preventability of certain Kinds of Premature Death."—J.S.

first, the omission (whether through neglect or through want of skill) to make due removal of refuse-matters, solid and liquid, from inhabited places ; and,

secondly, the licence which is permitted to cases of dangerous infectious disease to scatter abroad the seeds ot their infection.

In certain very important cases, injury—immense injury, accruing to the public health, arises from a co-operation of these two evils: arises, namely, through the special facility which (as I shall presently illustrate) certain forms of local uncleanliness provide for the spreading of certain specific infections ; and the influence which uncleanliness almost necessarily exerts in that way against the public health, make so large an addition to the influence which it exerts in other ways, that, in total power, uncleanliness must, I think, without doubt, be reckoned as the deadliest of our present removable causes of disease.

and particularly in the degrees which constitute Filth.

In stating this opinion of its fatal influence, I do not refer to it in its minor degrees, as compared with high standards of cleanliness or chemical purity, but refer chiefly to such degrees of it as fall, or ought to fall, within the designation of FILTH :—to degrees, namely, which in most cases obviously, and in other cases under but slight mask, are such as any average man or woman should be disgusted at: such as, eminently, the presence of putrescent refuse-matter, solid and fluid, causing nuisance by its effluvia and soakage. Also in imputing to Filth, as thus illustrated, that its effluvia are largely productive of disease, I do not ignore that disease is also abundantly caused by air which is fouled in other ways. Particularly I do not forget the effluvia of overcrowding : that, within dwellings which are populated beyond their means of ventilation, the foulness of air, due to the non-removal of the volatile refuse of the human body, is as strictly within the physiologist's definition of Filth, and as truly a nuisance within the scope of sanitary law, as any non-removal of solid or liquid refuse : but for the purpose of my present observations, the question of overcrowding is something to be set aside as distinct, and the word "Filth" is therefore here used distinctively in that sense which suggests subject-matter for sewers and scavenging.

Old general knowledge of the hurtfulness of Filth.

6.—It has been among the oldest and most universal of medical experiences that populations, living amid Filth, and within direct reach of its polluting influence, succumb to various diseases which under opposite conditions are comparatively or absolutely unknown; and the broad knowledge that Filth makes Disease is amply represented in the oldest records which exist of legislation meant for masses of mankind. The exacter studies of modern times have further shewn that by various channels of indirect and clandestine influence (some of which I shall presently illustrate) Filth can operate far more subtly, and also far more widely and more destructively, than our forefathers conjectured. The later almost equally with the former knowledge, the finer almost equally with the more general, is indispensable for sanitary administration in modern times; and Filth is little likely to be guarded against with that thoroughness of detail which present science shows to be necessary, unless the detail follow some intelligent appreciation of the ways in which Filth becomes destructive. This more exact knowledge, though it owes its origin to medical observation, and will no doubt constantly be receiving additions from the same source, is such as at least all well-educated persons of the general public may be expected gradually to acquire and apply; and I believe that our newly instituted Medical Officers of Health will be rendering not their least service to the public, when they shall make their own possession of this branch of medical knowledge, and their consequent power of interpreting many obscure productions of disease, subservient to the education of the laity among whom they act.

Modern, more particular, knowledge of its modes of hurtful operation.

7.—An important suggestion of modern science with regard to the nature of the operations by which Filth, attacking the human body, is able to disorder or destroy it, is: that the chief morbific agencies in Filth are other than those chemically-identified stinking gaseous products of organic decomposition which force themselves on popular attention. Exposure to the sufficiently concentrated fumes of organic decomposition (as for instance in an unventilated old cesspool or long-blocked sewer) may, no doubt, prove immediately fatal by reason of some large quantity of sulphide of ammonium, or other like poisonous and fœtid gas, which the sufferer suddenly inhales; and far smaller doses of these fœtid gases, as breathed with extreme dilution in ordinary stinking atmospheres, both give immediate headache and general discomfort to sensitive persons temporarily exposed to them, and also appear to keep in a somewhat vaguely depressed state of health many who habitually breathe them: but here, so far as we yet know, is the end of the potency of those stinking gases. While, however, thus far there is only the familiar case of the so-called *common chemical poison,* which hurts by instant action and in direct proportion to its palpable and ponderable dose, the other and far wider possibilities of mischief which we recognise in Filth are such as apparently must be attributed to *morbific ferments* or *contagia;* matters which not only are not gaseous, but on the contrary, so far as we know them, seem to have their essence, or an inseparable part of it, in certain solid elements which the microscope discovers in them: in living organisms, namely, which in their largest sizes are but very minute microscopical objects, and at their least sizes are probably unseen even with the microscope; organisms which, in virtue of their vitality, are indefinitely self-multiplying within their respective spheres of operation, and which therefore, as in contrast with common poisons, can develop indefinitely large ulterior effects from first doses which are indefinitely small. Of ferments thus characterised, the apparently essential factors of specific chemical processes, at least one sort—the ordinary septic ferment*—seems always to be present where putrefactive changes are in progress, as of course in all decaying animal refuse; while others, though certainly not essential to all such putridity, are in different degrees apt, and some of them little less than certain, to be frequent incidents of our ordinary refuse. As, apparently, it is by these various agencies (essential and incidental) that Filth produces "zymotic" disease, it is important not to confound them with the fœtid gases of organic decomposition; and the question, what infecting powers are prevalent in given atmospheres, should never be regarded as a mere question of stink. It is of the utmost practical importance to recognise in regard of Filth, that agents which destroy its stink may yet leave all its main powers of disease-production undiminished. Whether the ferments of disease, if they could be isolated in sufficient quantity, would prove themselves in any degree odorous, is a point on which no guess needs be hazarded; but it is certain that in doses in which they can fatally infect the human body they are infinitely out of reach of even the most cultivated sense of smell, and that this sense (though its positive warnings are of indispensable sanitary service) is not able, except by indirect and quite insufficient perceptions, to warn us against risks of morbid infection. Even as regards the positive notices which we receive by the sense of smell with regard to putrefactive decomposition, we must not assume that the diffusion and potency of septic ferment in the air necessarily go pari passu with the diffusion and offensiveness of the fœtid gases:—Witness, on a very large scale, the experience of London in the summer of 1858; when as persons who were then freqenting Westminster may well remember, our tidal river, enormously charged with decomposing sewage, stank week after week in a degree which excited much public alarm as to the possible consequences of the nuisance, and even led to an immediate interference of the Legislature; but when, though the quantity of sulphuretted hydrogen in the river-atmosphere was such as rapidly to blacken the ordinary chemical test-papers, as well as to affect in the same way the lead-paint of vessels on the river, and was enough also to produce among persons much engaged on the river such signs of sulphide-poisoning as I have above mentioned, the particular ailments

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* For convenience I use the singular number, but have no intention of implying that ordinary putrefactive changes have only one ferment which can be considered habitual to them.—J.S.

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* See the word "speedily" in the preamble of the amending Metropolis Local Management Act, 21 & 22 Vict., c. 104.—J.S.

which attest the working of septic ferment on the human body were in even less than average prevalence among the unwilling subjects of this large experiment.*

Filth-ferments in their relation to air :

It must be remembered that gases on the one hand, and the particulate ferments on the other, stand in widely different relations to air and water as their respective media of diffusion. The ferments, so far as we know them, shew no power of active diffusion in dry air: diffusing in it only as they are passively wafted, and then probably, if the air be freely open, not carrying their vitality far: but, as moisture is their normal medium, currents of humid air (as from sewers and drains) can doubtless lift them in their full effectiveness, and, if into houses or confined exterior spaces, then with their chief chances of remaining effective: and ill-ventilated low-lying localities, if unclean as regards the removal of their refuse, may especially be expected to have these ferments present in their common atmosphere, as well as teeming in their soil and ground-water.

and to water.

Considerations like some which I have stated in regard of infective air apply equally to infective water. In the latter, just as in the former, the zymotic malignity is but indirectly and most imperfectly suggested to us by qualities which strike the common sense, or by matters which chemical analysis can specify. As any unbrutalised sense of smell will turn with disgust from certain airs, so will it, and common taste and sight, be repelled by certain waters; and as the chemist can shew certain foulnesses in the one, so he can shew certain foulnesses in the other; but these tests, it must always be remembered, are tests only of the most general kind. Confessedly they do not touch the *corpus delicti,* but only certain conditions to which it is or may be collateral; and their negative findings are consequently not entitled to the same sort of confidence as their positive. Chemical demonstration of unstable nitrogenous compounds in water is a warning which of course should never be disregarded: but till chemistry shall have learnt to identify the morbific ferments themselves, its competence to declare them absent in any given case must evidently be judged incomplete, and waters which chemical analysis would probably not condemn may certainly be carrying in them very fatal seeds of infection.

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* The particulars of this very interesting experience are given in my Second Annual Report to the Privy Council, in a paper for which I was indebted to Dr. Ord, Physician to St. Thomas's Hospital.—J.S.

Excess of disease in filthy places not always due only to the Filth

8.—Populations under the influence of Filth are in many cases suffering not only from that influence, but also from other removable causes of disease; and in any endeavour to estimate at all exactly, as for administrative judgment, the injury which is derived from Filth, evidently those additional influences should as far as practicable be made matter of separate account. In one case a filthy neighbourhood may be so poor that mere privation is an appreciable cause of disease in it. In another case, the population may be so badly housed in respects which by themselves would not be classed as Filth,—may be so overcrowded in their dwellings, or be inhabiting such close or ill-built quarters, that this has to be counted as causing disease. In a third case, some particular collective occupation, injurious to the adults and adolescents who follow it, may be creating disease additional to that which the Filth produces. In a fourth case, swarms of infants and young children, whose mothers are engaged away from home in some local industry, may be suffering disease from neglect and mismanagement: and so forth. And evidently if one would see what harm Filth can do in its own ways, one must discriminate it as far as possible from such concomitants as the above.

but notwithstanding mixed cases, the hurtfulness of the Filth is certain.

In filthy urban districts, where the foul air, comparatively incarcerated in courts and alleys and narrow streets, can act with most force in regard to masses of population, the population always shews an increased mortality under several titles of disease. Such miscellaneous increase of mortality affects probably all ages, more or less, but a distinctively large proportion of it attaches to the children. Apparently the mere influence of the Filth (apart from other influences) in such a district will be causing the infants and young children to die at twice or thrice or four-times their fair standard rate of mortality; and this disproportion, which becomes even more striking when the chief epidemics of ordinary childhood (measles and whooping-cough and scarlatina) are left out of the comparison, seems to mark the young lives as finer tests of foul air than are the elder and perhaps acclimatised population.

In trying to analyse the death-statistics of filthy districts, we soon find that, with regard to many of the separate elements in the miscellaneous mortality, we cannot argue in exact scientific terms: partly because very large quantities are registered under names which have no definite nosological meaning,—e.g. "convulsions," "teething," "atrophy," "consumption"; partly also because some kinds which we can fairly identify by name (e.g. pneumonia) are such as we do not always ætiologically understand; and sometimes we may be only able to establish the broad fact that, within the area of Filth, the deaths, in total amount, are greatly more numerous than ought to be, and that the excess (or in mixed cases a certain share of the excess) can only be accounted for as the effect of the Filth. Though, when that broad conclusion is reached, more detailed conclusions may at first sight scarcely seem wanted for practical purposes, yet there is advantage in establishing the details of each case as exactly as the circumstances will allow; not only because it greatly concerns the progress of preventive medicine that all our attributions of cause and effect should be in the spirit of exact science, but also because in regard to filthy rural districts the argument from general death-rates would often be insufficient to carry conviction: and I therefore proceed to speak with some particularity of individual diseases which can be traced to Filth.*

Of diseases distinctively due to Filth, the most characteristic are the diarrhœal.

9.—In all filthy districts, one particular class of diseases seems specially apt to stand in relief: the diseases, viz., which, in respect of their leading symptom, may be generalised as diarrhœal. These diseases, in their relation to Filth, deserve very special attention: first, on their own account, as extremely large causes of death; and secondly, because an exact knowledge of their method of production is likely to throw comparative light on the pathology of obscurer filth-diseases.

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* I would note that, writing here on these diseases only for immediate practical purposes, I am obliged to leave unnoticed various of the more scientific aspects of the subject, as I must thus leave undiscussed the very interesting question of the influence of particular soils and seasons in favoring epidemics of Filth-Disease, I would the more especially refer to the very valuable and suggestive writings of Professor v. Pettenkofer, of Munich, on this branch of the study of Cholera and Enteric Fever.—J.S.

Common diarrhœa, and its relation to Filth.

A certain large quantity of endemic diarrhœa is medically spoken of as "common," in contrast with such so-called "specific" diarrhœal diseases as cholera and enteric fever. Perhaps in a certain sense all might equally claim to be called "specific:" since, no doubt, each distinct effect has essentially its own distinct cause: but at least provisionally the contrast of terms is convenient, because much "common" filth-produced diarrhœa (with perhaps much else of the miscellaneous mortality of the same districts) may reasonably be ascribed to infection with the "common" septic ferment which is an attribute of all filth. Among the effects which arise under experimental septic infections, as likewise in cases of accidental septicæmia in the human subject, acute catarrh of the mucous membrane of the intestines is an extremely prominent fact. The mucous membrane of the intestinal canal seems peculiarly to bear the stress of all accidental putridities which enter the blood. Whether they have been breathed or drunk or eaten, or sucked up into the bloodvessels from the surface of foul sores, or directly injected into bloodvessels by the physiological experimenter, there peculiarly the effect may be looked for: just as wine, however administered, would "get into the head," so the septic ferment, whencesoever it may have entered the blood, is apt to find its way thence to the bowels, and there, as universal result, to produce diarrhœa.

Enteric fever and its relation to excremental infection.

10.—It seems certain, however, that in the high diarrhœal mortality of filthy places, infections, of the sorts already recognised as "specific," exercise always a very great influence: and in the studies which have made a basis for the suggestions of preventive medicine in relation to Filth, none have hitherto been so instructive as the study of these "specific" filth-infections. To them I would now particularly advert; referring first to the disease which of late years has for sufficiently sad reasons become well known to the public of this country under the name of Enteric or Typhoid Fever.

Since the year 1849, when Dr. (now Sir William) Jenner made known his conclusive and masterly discrimination of this specific form of fever, successive studies have tended with singular uniformity to connect it in regard of its origin with nuisances of an excremental sort.* In illustration of that fact in the natural history of enteric fever, I may refer to an abstract which I append of the experience of the Medical Department during the four years 1870–3 in this particular branch of disease-production: and such illustrations might be multiplied to any desired extent. The experience is, not only that privies and privy-drainage, with their respective stinkings and soakings, and the pollutions of air and water which are thus produced, have in innumerable instances been the apparent causes of outbreaks of enteric fever, but, further, that they have seemed capable of doing this mischief in a doubly distinctive way: first, as though by some aptitude which other nuisances of organic decomposition, though perhaps equally offensive, have not seemed equally or nearly equally to possess; and secondly, as though this specific property, so often attaching to them in addition to their common septic unwholesomeness, were not, even in them, a fixed property. The explanation of this experience, the explanation of the frequent but not invariable tendency of privy-nuisances to infect with enteric fever, has seemed to consist in the liability of such nuisances to carry with them, not invariably, but as frequent accidental adjuncts, the "specific" contagium of any prevailing bowel-infection: for presumably the privies of a population receive (inter alia) the diarrhœal discharges of the sick; and it has long been matter of fair pathological presumption that in any "specific" diarrhœa (such as eminently is enteric fever) every discharge from the bowels must teem with the contagium of the disease.* Medical knowledge in support of this presumption has of late been rapidly growing more positive and precise ; and at the moment of my present writing I have the gratification of believing that under my Lords of the Council it has received an increase which may be of critical importance, in a discovery which seems to give us for the first time an ocular test of the contagium of enteric fever : in the discovery, namely, of microscopical forms, apparently of the lowest vegetable life, multiplying to innumerable swarms in the intestinal tissues of the sick, penetrating on the one hand from the mucous surface into the general system of the patient, and contributory on the other hand, with whatever infective power they represent, to the bowel-contents which have presently to pass forth from him.† Adverting then summarily, in an administrative point of view, to the present state of medical knowledge and opinion as to the way in which enteric fever spreads its infection in this country, I would say that it is difficult to conceive, in regard to any causation of disease in a civilised community, any physical picture more loathsome than that which is here suggested : that apparently, of all the diseases which are attributable to Filth, this, as an administrative scandal, may be proclaimed as the very type and quintessence: that, though sometimes by covert processes which I will hereafter explain, yet far oftener in the most glaring way, it apparently has an invariable source in that which of Filth is the filthiest: that apparently its infection runs its course, as with successive inoculations from man to man, by instrumentality of the molecules of excrement which man's filthiness lets mingle in his air and food and drink.

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* The very able writings of Dr. Murchison, dating from a paper by him in the Medico-Chirurgical Transactions of 1858, have been of particular influence in that contention.—J.S.

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* This is the argument of the late Dr. John Snow : which though urged by him more particularly in relation to Asiatic Cholera, was meant by him to have general application, and was expressly applied by him to enteric fever. In the latter relation it has from 17 years ago been constantly and very powerfully urged by Dr. Wm. Budd, of Clifton. From the beginning of our European experiences of Cholera the doctrine of the specific infectiveness of the discharges in the disease had been argued by Dr. von Gietl of Munich, to explain, as he maintained, the atmospheric diffusion of the epidemic influence —J.S.

† This discovery (as I believe it to be) of the microphyte of enteric fever is the work of Dr. Klein, Assistant-Professor in the Brown Institution, and arose in one of the *Scientific Investigations in aid of Pathology and Medicine* which I have the honor of superintending under my Lords of the Council. The details of the subject are still undergoing investigation at Dr. Klein's hands.—J.S.

Cholera, and its relation to excremental infection.

11.—It seems certain that the distribution in England of an immense quantity of other specific disease must exactly follow that disgusting type. The local affinities of Asiatic Cholera, when present in this country, have always been so close to those of enteric fever, in respect of its association with circumstances of excremental filth, and the lines of pathological argument on this association (even apart from evidence which has been alleged on the direct communicability of cholera to the lower animals) are so parallel in the two cases, that no reasonable doubt can, I think, be entertained as to the substantial dependence of cholera-epidemics in this country on the opportunities which are ever widely open for the above-described filthy method of infection. Indeed, with regard to the manner of spread of the entero-zymotic diseases generally, it deserves notice that the whole pathological argument which I am explaining grew among us in this country out of the very cogent facts which our cholera-epidemics specially supplied, and to which the late Dr. John Snow, twenty-five years ago, had the great merit of forcing medical attention: an attention at first quite incredulous, but which, at least for the last fifteen years, as facts have accumulated, has gradually been changing into conviction.

Similar relation of other diseases.

12.—The argument which applies to the bowel-discharges of Cholera and Enteric Fever, and which, in regard of them, rests on a very large quantity of detailed evidence, seems to extend by extremely strong analogy to every disease, whether nominally "common" or "specific," in which the human intestinal canal is the seat of infected changes: chiefly perhaps to such diarrhœal and dysenteric infections as are exclusively or distinctively intestinal, but likewise, I apprehend, more or less, to every general infection (such for instance as scarlatina) in proportion as it inclusively infects the bowels: and it would thus seem probable that air and water, having in them the taint of human excrement, must often carry with them, whithersoever they pass, the seeds of current morbid infections.

Powers of common septic infection to produce disease.

13.—But though hitherto, for convenience of argument, I have referred specially to the influence of human excrement in determining the spread of "specific" infections from man to man, and provisionally as if man's body were the sole birthplace of the several contagia which afflict his kind, assuredly that intermediary influence is but part, and it may be but a very subordinate part, of the faculty by which Filth produces disease. While it is indeed true as regards some contagia that at present we know them only as incidents of the human body, wherein we see them in case after case multiplying their respective types with a successivity as definite and identical as that of the highest orders of animal or vegetable life,—and while thus it is at present true, for instance, of small-pox or syphilis, that a case arising independently of a previous like case is hitherto practically as unknown to us as the parentless production of dog or cat, our knowledge with regard to other very important contagia is growing to be of larger scope. I would mention it as among the most hopeful advances of modern preventive medicine, that some diseases, which, in the sense of being able to continue their species from man to man, are apparently as "specific" as those which I have abovenamed, seem now beginning to confess in detail a birth-place exterior to man, a birth-place amid controllable conditions in the physical nature which is around us, a birth-place amid the "common," putrefactive changes of dead organic matter. Referring again now to what I have not pretended to be able to analyse in detail—the excess of miscellaneous, and in great part nominally "common," disease in filthy neighbourhoods, I would particularly wish to connect with that subject a reference to our growing scientific knowledge in the matter of the "common" septic ferment. The pathological studies of late years, including eminently certain very instructive researches which Professor Sanderson has conducted under my Lords of the Council, have clearly shewn that in the "common" septic ferment, or in some ferment or ferments not hitherto to be separated from it, there reside powers of disease-production as positive, though not hitherto as exactly defined, as those which reside in the variolous and syphilitic contagia. Experimentally we know of this ferment, that, when it is enabled by artificial inoculations to act in its most effective way on the animal body, and even more when it has received a curious increment of strength which its first propagation within the living body seems to bestow on it, it shews itself one of the most tremendous of zymotic poisons. It rapidly in the one animal body develops disease which then is communicable to another: febrile disease, with inflammations numerous and intense, and including in marked degree one of the acutest known forms of intestinal inflammation and flux: disease exactly corresponding to certain very fatal and unfortunately not infrequent infections to which lying-in women, and persons with accidental wounds and the wounds of surgical operations, are most subject, but which also sometimes occur independently of such exceptional states; infections, chiefly known under the names of erysipelas, pyæmia, septicæmia and puerperal fever; infections, which we sometimes see locally arising anew in unquestionable dependence on Filth, but of some of which, when arisen, it is perfectly well known that they are among the most communicable of diseases. And a further, perhaps still more instructive, teaching of the artificial infections is this: that the "common" ferment, which in its stronger actions quickly destroys life by septicæmia, can in slighter actions start in the infected body chronic processes which will eventuate in general tubercular disease. I need hardly point out that the above facts, extremely suggestive though they are, must of course, in relation to my main argument, be applied only under certain reserve; that evidently the exact conditions of the physiological experiment are not reproduced in ordinary life; and that against the common septic ferment, as presented in fouled atmosphere or fouled drinking water, the living human body in its normal state can apparently make considerable (though presumably not unlimited) resistance. But after all such reserves the truth remains, that, looking well at the pathology of human life under residence in foul air, we find ourselves again and again reminded of these results of physiological experiment: often seeing phthisis and other tubercular and like diseases gradually developed, as though under gradual overpowering of the limited normal resistance to the septic ferment; or seeing—and particularly where some exceptional bodily state (wounded or puerperal) gives opportunity, the sudden invasion of erysipelas or other septic infection, not in discoverable dependence on any human infectant, but conceivably a filth-inoculation from the air.* The line of reflection thus suggested is one which I cannot now follow further, but of which the practical interest seems to be extremely great. For, while the excessive production of fatal disease in filthy neighbourhoods is a fact as to which there can be no doubt, and of which the immediate significance is deplorable, the ulterior suggestion is this: that so far as Filth in any instance produces anew such a disease as erysipelas or puerperal fever on the one hand, or phthisis or other tubercular disease on the other, the mischief first done is of a sort which entails certain possibilities of extension: such, namely, that in the one instance by accidental contagion, as in the other instance by hereditary transmission, it may, for aught we know, indefinitely extend beyond the sphere in which Filth first produced it.

II.

Forms in which Filth is found producing disease:

14.—Having in the above statements explained what I believe to be the present knowledge of my profession with regard to the diseases which Filth is apt to produce in the human body brought under its influence, and with regard therefore to the exact dangers which each prevalence of Filth implies, I now turn to the more administrative aspects of the matter, and may begin by referring to the chief forms in which Filth is apt to be about us.

Filth operating where it stands:

15.—There are houses, there are groups of houses, there are whole villages, there are considerable sections of towns, there are even entire and not small towns, where general slovenliness in everything which relates to the removal of refuse-matter, slovenliness which in very many cases amounts to utter bestiality of neglect, is the local habit: where, within or just outside each house, or in spaces common to many houses, lies for an indefinite time, undergoing fœtid decomposition, more or less of the putrefiable refuse which house-life, and some sorts of trade-life, produce: excrement of man and brute, and garbage of all sorts, and ponded slop-waters: sometimes lying bare on the common surface; sometimes unintentionally stored out of sight and recollection in drains or sewers which cannot carry them away; sometimes held in receptacles specially provided to favor accumulation, as privy-pits and other cesspools for excrement and slop-water, and so-called dust-bins receiving kitchen-refuse and other filth. And with this state of things, be it on large or on small scale, two chief sorts of danger to life arise: one, that volatile effluvia from the refuse pollute the surrounding air and everything which it contains; the other, that the liquid parts of the refuse pass by soakage or leakage into the surrounding soil, to mingle there of course in whatever water the soil yields, and in certain cases thus to occasion the deadliest pollution of wells and springs. To a really immense extent, to an extent indeed which persons unpractised in sanitary inspection could scarcely find themselves able to imagine, dangers of these two sorts are prevailing throughout the length and breadth of this country, not only in their slighter degrees, but in degrees which are gross and scandalous and very often, I repeat, truly bestial. And I state all this in unequivocal language, because I feel that, if the new sanitary organisation of the country is to fulfil its purpose, the administrators, local and central, must begin by fully recognising the real state of the case, and with consciousness that in many instances they will have to introduce for the first time, as into savage life, the rudiments of sanitary civilisation.

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* See in Sixth Report to the Privy Council, observations on the so-called "traumatic infections" in their relations to Hospital Hygiene.—J.S.

Filth operating at a distance.

16.—A second point, which equally with the above needs to be recognised by all who are responsible for the prevention of Filth-Diseases, is: that Filth does not only infect where it stands, but can transmit its infective power afar by certain appropriate channels of conveyance; that, for instance, houses which have unguarded drainage-communication with cesspools or sewers may receive through such communication the same filth-infections as if excrement stood rotting within their walls; and that public or private water-reservoirs or water-conduits, giving accidental admission to filth, will carry the infection of the filth whithersoever their outflow reaches. Thus it has again and again happened that an individual house, with every apparent cleanliness and luxury, has received the contagium of enteric fever through some one unguarded drain-inlet; or that numbers of such houses have simultaneously received the infection, as an epidemic, in places where the drain-inlets in general have been subject to undue air-pressure from within the sewer. And thus equally on the other hand it has again and again happened that households, while themselves without sanitary reproach, have received the contagium of enteric fever through some nastiness affecting (perhaps at a considerable distance) the common water-supply of the district in which they are.*

Chief sources of excremental infection illustrated.

17.—When an epidemic of enteric fever, or of cholera or diarrhœa, has been traced (as in general it quite easily can be) to some gross excremental pollution of air or water, the primary source of such pollution will usually be under one or more of the following three heads, viz.—faults of public sewerage, faults of indoor water-closets and other apparatus of house-drainage, and the fault of bog-privies.

(1.) In regard of sewerage;

18.—The public sewerage may be at fault in either of two ways: first, in absence of sewers, so that slop-waters and other liquid filth, if not disposed of on the private premises, have to pass without proper tubular conveyance along public ways, either free on the general surface, or in open and generally very irregular channels meant only for rain-water, where necessarily they must more or less stagnate and stink and soak: secondly, in the existence of sewers which in themselves are more or less mischievous.

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* For illustrations how the infection of houses with Filth-diseases (and specially with enteric fever) is promoted by imperfect ventilation of sewers, I may refer to the case of Windsor, which I gave in my first Annual Report to the Privy Council, or to the cases of Croydon and Worthing which Dr. Buchanan describes in appendix to my Ninth Report, and of course these illustrations of infection on an epidemic scale would apply à fortiori to individual cases where the drain-inlets of houses are left untrapped. To illustrate the relations of polluted public water-supplies to the dissemination of cholera and enteric fever, I may refer to the collection of cases which I gave in my Twelfth Report.—J.S.

(*a.*) want of sewers;

With regard to non-provision of sewers in inhabited areas, apparently there often is an assumption that sewers may properly be dispensed with in cases where water-closets are not in use; that sewers (*i.e.* public drains of tubular type) are only wanted where the intention is to convey privy-refuse; and that, for the mere slop-waters of the population, the open way-side gutters which are meant for rain-water will suffice. This assumption can only rest on ignorance of what "slop-waters" really are, in respect of the filth which is contained in them; and its wrongness is sufficiently evident to anyone who observes how extremely offensive are in general such way-side gutters as are allowed to receive liquid refuse from groups of houses. Such refuse at its worst is a very condensed form of sewage, and even at its best is such as cannot without nuisance be let loiter and soak by the way-side. As soon as the point is passed at which houses can be expected to dispose of their own liquid refuse on their own ground, the point is reached at which proper public channels for the conveyance of such refuse should be provided; and the irregular way-side channels which may perhaps quite properly suffice for rainfall, cannot, I apprehend, in relation to slop-waters, be deemed such "sufficient sewers" as the law requires local authorities to provide.

(*b.*) faults in sewers;

Demerits in existing sewers can in some essential respects be judged by common observation. As the object of a sewer's existence is to prevent the stagnation of filth in and about houses and frequented places, and to guard against the dangerous pollution of air and soil which the filth, if not effectually conveyed away, must occasion, so, of course, any sewer which itself occasions any such stagnation and pollution is (in proportion as it does so) unsuccessful; and a sewer which stinks at its open gratings is, pro tanto, giving evidence of such unsuccess. The indispensable conditions of success in a sewer are, first that the flow of sewage to its outfall shall be, as perfectly as possible, continuous and complete and scouring, not ponded and leaking and depositing; and, secondly, that the sewer shall have perfect ventilation. A sewer in which these conditions are fulfilled will scarcely, if at all, under ordinary circumstances, cause appreciable odour at open (untrapped) gullies in the street; the air in it, if at times compressed, will not easily exert at the duly guarded inlets of house-drains any such pressure as can make way for it into houses; and in cases where accidental defects of house-drains unfortunately permit sewer-air to enter houses, the sewer-air will be at its lowest degree of dangerousness. It is a great security for such perfect ventilation of sewers as is essential to the safety of houses, that, in addition to whatever special ventilating-shafts are provided, street-gullies should as far as practicable be left untrapped: and complaint of nuisance from any such gullies should not necessarily be taken as reason for trapping them. In case of such complaint, the presumption is that from original ill-construction or some other cause the sewer does not properly fulfil its object, but has filth accumulated and stagnant in it as in a cesspool, and has its ventilation at least relatively in defect; and the nuisance which such a sewer occasions in the public way, is far less important than the risk incurred by the inhabitants of houses which drain into the sewer. Merely to trap street-gullies in any such case would be greatly to increase the danger to houses; the use of charcoal trays in gullies, in the hope to disinfect their effluvia, has repeatedly proved dangerous in the same way: and I accordingly think it an essential principle, that the evil of a stinking sewer should always be dealt with at its root. Thus, a sewer which is imperfectly ventilated should have perfect ventilation provided for it; a sewer which, though fairly constructed, is from poorness of current not completely self-scouring, should at due intervals have extrinsic flushing: and sewers which, with radical ill-construction, are virtually but cesspools under the street, should without delay be abolished.

(2.) in regard of house drainage and water-closets;

19.—Secondly, a very large danger to the public health, and particularly to the better-off classes of society, has of late years consisted in the recklessness with which house-drains, receiving pipes from water-closets, sinks, cisterns, baths, &c., in the interior of houses, and often actually within bedrooms or the adjoining dressing-rooms, have been brought into communication with sewers. Among architects and builders there seems to have been very imperfect recognition of the danger which this arrangement must involve, in even either of unskilful first construction or of subsequent mismanagement or want of repair. Then, in regard of construction, an almost unlimited trust has been placed in artisans who not only could hardly be expected to understand certain of the finer conditions (as to atmospheric pressure) which they had to meet, but who also in not a few instances have evidently failed to apprehend that even their mechanical work requires conscientious execution. Under influence of the latter deficiency there have been left in innumerable cases all sorts of escape-holes for sewer-effluvia into houses, and disjointed drains effusing their filth into basements: while under the other deficiency, house-drainage, though done with good workmanlike intention, has often, for want of skilled guidance, been left entirely without exterior ventilation, and sometimes has in addition had the over-flow pipes of baths or cisterns acting as sewer-ventilators into the house: and all this not infrequently in places where the sewer itself, from which so much air has been invited, has been an ill-conditioned and unventilated sort of cesspool. It is almost superfluous to say that under circumstances of this sort a large quantity of enteric fever has been ensured; and I should suppose that also a very large quantity of other filth-disease must have sprung from the same cause. Then there has been the vast quantity of interior air-fouling which arises from mismanagement of drain-inlets, or from non-repair of worn-out apparatus: as when sink-traps, injudiciously made moveable, have been set aside; or when pipes under temporary disuse, having evaporated all water from their traps, or leaden closet-pipes, with holes corroded in them, have been left fouling the house with a continuous eructation of sewer-air.* Again, in poor neighbourhoods, water-closets have in many cases been constructed with scanty and ill-arranged water-service to flush them, or have even been left to only such flushing as the slop-water of the house, or other water thrown in by hand, might give: and again and again these ill-watered and often obstructed closets have been found acting on a large scale as causes of disease. Again, a different sort of danger, and one which seems capable of wide operation, has been seen to arise where water-closets receive their flushing-service from the mains of a so-called "constant" supply: for supplies called constant must not only sometimes intermit for purposes of necessary repair, but also in some cases are habitually cut off during the hours of night; and the danger is that, during times of intermission, if there be not service-boxes or cisterns between the privy-taps and the mains, privy-effluvia and even in some cases fluid filth will be (so to speak) sucked from closet-pans into water-pipes. This danger, which hitherto has been little known to the public, but which it is important to have well understood, is illustrated by two remarkable reports which I subjoin, respectively by Dr. Blaxall and Dr. Buchanan, on outbreaks of enteric fever thus occasioned. Dr. Blaxall's report [A] is of particular interest, as it represents, I believe, our first departmental discovery of this cause of disease in actual operation;† and Dr. Buchanan's [A] seems to me of remarkable value, not only as being in itself a model of exact ætiological inquiry, but as illustrating the filth-causation of enteric fever clandestinely affected, under circumstances where primâ facie any filth-disease would have seemed impossible.

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* Dr. Andrew Fergus of Glasgow in papers of much sanitary interest contributed by him to the Edinburgh Medical Journal (February 1872 and February 1874) adduces evidence to show that the ordinary corrosion of leaden pipes from closets and sinks is a chemical effect of sewer-air, and that it goes on with greatly increased rapidity in cases where the pipes are unventilated.—J.S.

† I am glad to note, as corroboration from a source which I highly esteem, that, while Dr. Blaxall was recording the observations which he had made at Sherborne in evidence of the above mode of production of enteric fever, Dr. Alfred Carpenter of Croydon was recording independent observations which he had made in that town to the same effect. *See* "Public Health," July, 1873.—J.S.

(3.) in regard of accumulative privies.

20.—Thirdly, while it cannot be denied that ill-devised and ill-managed water-closets and their accompaniments have caused (and particularly among the better-off classes of society) filth-diseases to a very large extent, a far larger range of mischief throughout England has attached to the other kinds of privy-arrangement: and of all the filth-influences which prevail against human life in this country, privies of the accumulative sort operate undoubtedly to far the largest extent.

By what standard should they be judged?

The intention and, where realised, the distinctive merit of a system of water-closets is, that in removing excremental matters from a house it does so with perfect promptitude, and in a perfectly neat and complete manner, not having any intervals of delay, nor leaving any residue of filth, nor diffusing any during its operation; and where the water-system is not in use, these objects ought still as far as possible to be secured. Thus, in the absence of water-closets, evidently any reasonable alternative system ought to include the following two factors, brought into thoroughly good mutual adjustment: first, proper catchment-apparatus in privies; and secondly, proper arrangements for privy-scavenage. The essential conditions of a proper catchment-apparatus are that it, as well as all adjacent underworks of the privy, shall as far as practicable be unabsorbent; that it shall absolutely preclude soakage or leakage of filth into soil or buildings or water; that it shall not admit rainfall or slop-waters; that it shall be so limited in size as not to allow of any needlessly offensive accumulations of matter; and that, whether moveable or fixed, it shall easily admit of thorough cleansing. The essential conditions of proper privy-scavenging are, that it shall be strictly methodical; that from beginning to end it shall be so conducted as to occasion the least possible nuisance, public or private; that its performance shall be at such short intervals as invariably to precede the putrefaction of the excrement; and that there shall be associated with it all such acts of thorough cleansing as the catchment-apparatus and other underworks of the privies may require. Further, in order that the fulfilment of these conditions may be possible, it is essential that the location and approaches of the privy should be definitely adapted to acts of scavenage.

Their actual relation to that standard.

Now, hitherto, in places not having water-closets, the general practice has flagrantly contravened those conditions. Either it has had no other catchment-apparatus than the bare earth beneath the privy-seat, and has trusted that this (receiving the excrements and often also the house-slops on to its natural surface or into a hole dug into it) would absorb and drain away the fluid filth, and serve during months and years as heaping-place for the remainder; or else it has had, as supplement to the privy, a large enclosed midden-stead or cesspool, partly or entirely of brickwork or masonry, intended to retain large accumulations of at least the solid filth, with or without the ashes and other dry refuse of the house, and in general dividing its fluid between an escape-channel, specially provided, and such soakage and leakage in other directions as the construction has undesignedly or designedly almost always permitted. Privies, such as these, have not been meant to have their filth removed except when its mere largeness of bulk (exceeding or threatening to exceed the limits of the privy-pit or cesspool or midden) might mechanically make removal necessary, or else when there might happen to arise an agricultural opportunity for the stuff; and public scavenging in relation to such privies has either had no existence, or has been adapted to the supposition of an indefinite local tolerance of accumulation. All this accumulation, with its attendant exhalation and soakage, and at intervals the shovelling and carting away of its masses of fœtid refuse, and the exposure of the filth-sodden catchment-surfaces of privy-pits and middens, has been, as needs hardly be said, an extreme nuisance to those in whose vicinity it has been; and sometimes with the aggravating condition that, because of the situation of the privy, each filth-removal must be through the inhabited house. What nuisance this system at present constitutes in innumerable populous places, including some of our largest towns, can indeed hardly be conceived by persons who do not know it in operation; and the infective pollutions of air and water-supply, which it occasions to an immense extent in towns and villages throughout the country, are chief means of spreading in such places some of the most fatal of filth-diseases.

Excremental infection which has caused disease may require careful search to expose it:

21.—Such are the three heads, under one or more of which will commonly be found the true explanation of outbreaks and prevalences of entero-zymotic disease in the different districts of this country; and outbreaks which from time to time have arisen in seeming dissociation from such causes as I describe have again and again, under minute examination, resolved themselves into new illustrations of the general rule. For administrative reasons it is highly important that cases which seem exceptional should be thoroughly studied; and especially as regards enteric fever (because it apparently obeys so very sharply defined a rule of causation) I would advocate the strictest scrutiny of any origination which may seem not to have been excremental. Present knowledge seems very positively to say that the degree and extent in which enteric fever shall remain unexterminated from England will express the degree and extent in which sanitary administration shall have failed in rudimentary duties; and since, in particular local applications of this test, the prevalence of enteric fever in any district will primâ facie impugn the sufficiency of the local administration, it becomes of the more importance that the habits of the disease should be well understood, and that every mystification of unexplained facts should as far as possible be removed. An unexplained outbreak of enteric fever will sometimes mean, as in one very instructive case reported [A], that the locality where the disease occurs has had in it, as its own local property, some curiously unsuspected liability to filth-infection: but on the other hand there are circumstances under which the excremental nuisance of one district may exceptionally do its mischief in another. This possibility might of course be illustrated by any such conductions of filth as I have noted in a former passage of these observations; but I wish here to draw particular attention to the possibility, now well-established, of filth-infection being transmitted even on a large scale from district to district in particular articles of food, and especially in the article of milk. In 1870, Dr. Ballard, now of this Depart-

as in case reported;

and in various epidemics produced by infected milk supply.

ment, but who at that time was working with high character as Officer of Health for the parish of Islington, was able to shew that an outbreak of enteric fever, which had attacked in ten weeks 70 families and 175 persons in part of his district, coincided with the use of milk supplied from a particular dairy, where shortly before the outbreak there had been cases of enteric fever, and where apparently the infected house-drainage must have had easy access to an underground water-tank on the premises. There could be little reasonable doubt as to what in this epidemic had been the infectant; and since Dr. Ballard's connexion with this Department it has twice happened to him to be able very clearly to trace the same method of infection at work in considerable outbreaks of enteric fever which he has been investigating; one in 1872 at Armley in the borough of Leeds, the other in 1873 at Moseley and Balsall Heath near Birmingham. A like case on a very large scale, and in some respects of unique interest, occurred also last year in London, chiefly in and about Marylebone, and was investigated elaborately by Mr. Netten Radcliffe, assisted in some stages of the inquiry by Mr. Power. A special interest of this case, as regards the point to which I have been adverting, is that here a great outbreak of enteric fever occurred at a distance of forty or fifty miles from the sanitary jurisdiction in which its true cause was contained; and the case is of the more value because the outbreak, as it happened to be in London, and happened also to have struck at its first blow in the houses of more than a dozen physicians and surgeons, had from the first its circumstances very attentively noticed by an unusual number of competent observers deeply interested in a right knowledge of them. I subjoin [A] the instructive reports which relate to these three epidemics of enteric fever, respectively referable to supplies of milk. There is in each case every reason to believe that the epidemic was due to excremental pollution of the dairyman's well; and it is solely in that point of view that I here insist on the cases. How the dairyman's water was enabled to spread its influence to his milk, and by what proportionate admixture it did so, are questions of little importance to my present subject-matter. The essential point is, that the water with which a dairyman washes his pails, and of which a very variable quantity may under varying circumstances remain in them as an addition to his milk, is not likely to be of better quality than that which he and his local sanitary authority consider good enough for his own drinking; and that in regard of this and many like possibilities of casual filth-infection, the general public are in intimate sanitary partnership with various of their purveyors of food.

III.

To prevent Filth-Diseases, Filth must be prevented.

Disinfectants can only give a very subordinate assistance.

22.—In order to the prevention of Filth-Diseases, the prevention of Filth is indispensable. Truism though this may seem, I think it needs to be expressly insisted on, as against any belief that districts, allowed to become filthy, can off-hand be made wholesome by disinfectants. To chemically disinfect (in the true sense of that word) the filth of any neglected district, to follow the body and branchings of the filth with really effective chemical treatment, to thoroughly destroy or counteract it in muck-heaps and cesspools, and ashpits, and sewers, and drains, and where soaking into wells, and where exhaling into houses, cannot, I apprehend, be proposed as physically possible; and the utmost which disinfection can do in this sense is apparently not likely to be more than in a certain class of cases (see § 39) to contribute something collateral and supplementary to efforts which mainly must be of the other sort. This opinion, as to the very limited degree in which chemistry can prevail against arrears of uncleanliness, does not at all discredit the appeals which are constantly and very properly made to chemistry for help in a quite different sphere of operation; with regard, namely, to the management of individual cases of infectious disease, and to the immediate disinfection of everything which comes from them.* In this latter use of disinfectants, everything turns on the accuracy and completeness with which each prescribed performance is done; but such accuracy and completeness are of course only to be ensured where operations are within well-defined and narrow limits; and in proportion as disinfection pretends to work on indefinite quantities or in indefinite spaces, it ceases to have that practical meaning. Again and again in the experience of this department a district has been found under some terrible visitation of enteric fever, from filth-infection operating through house drains or water-supply; but with the local authority inactive as to the true cause of the mischief, and only bent on practising about the place, under name of disinfection, some futile ceremony of vague chemical libations or powderings. Conduct such as this, referring apparently rather to some mythical "epidemic influence" than to the known causes of disease, and savouring rather of superstitious observance than of rational recourse to chemistry, is eminently not that by which filth-diseases can be prevented; and, contrasting it therefore with means by which that result can be secured, I would here specially note a warning against it.

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* As regards certain procedures on a small scale, we know that, with well-circumscribed matter to work upon, and with chemical action precisely adjusted to its task, we can absolutely kill any given contagium. Taking, for instance, a bit of glass which has on it a charge of vaccine or variolous matter, we know that, if we *sufficiently* heat it in the flame of a lamp, or *sufficiently* treat it with certain strong officinal chemicals which act in a like manner, we annihilate the power of infection; and we know that, in the sick-room where lies a patient with any dangerous infectious disease—say diphtheria, small-pox, or enteric fever, we

The essential preventive is cleanliness;

23.—In order to reduce that vast quantity of preventable disease which has its type in enteric fever, and in relation to which each individual case of enteric fever which occurs ought to be regarded as having an important local significance, the one essential condition is CLEANLINESS. That local sanitary authorities, proceeding to act upon this principle,

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can to some extent imitate the above acts. Provided that real skill shall direct, and real conscientiousness shall execute, what has to be done, every tangible discharge which passes from the patient, every sheet or towel or handkerchief which any discharge from him has fouled, can be treated with heat or other disinfectant in a way to give at least comparative security against any outward spreading of his infection. It is greatly to be hoped that, with time and with progress of general education, the systematic doing of such acts as these will in each sick-house be considered an imperative duty of good citizenship, and may at last be so fully understood in that light as to be made, as far as practicable, an obligation at law: for disinfection in that sense (however remote we may now be from any sufficient adoption of it) would undoubtedly, if adopted, make chemistry an important ally to cleanliness in combating the filth-diseases of England; but such disinfection, the whole value of which is in its precision, differs diametrically from the pretended district-disinfections to which my text refers.—J.S.

with a clear intelligence of what cleanliness really means, and with sincere resolution to enforce it in their respective districts, can within a few years reduce by some tens of thousands the annual mortality of England, is, I think, at least as certain as that such ought to be the aim of their existence.

in the highest degree in which it can be attained.

24.—The perfection of cleanliness would be that all refuse-matters should from their very beginning pass away inoffensively and continuously: and the principles of approximation to that ideal must evidently be, first to provide to the largest practicable extent for the continuous outflow of refuse as fast as produced, and secondly (so far as continuous outflow cannot be got) to provide for the closest possible limitation and the completest possible innocuousness of such refuse as is unavoidably detained. Rules like these present themselves as mere transcripts from Nature to those who know as physiologists how the animal body, in its individual working, deals with the refuse of its own vital actions: and the individual body, hindered in its respiration or other excretory acts, may serve to picture the inevitable unhealthiness of any community, whether large or small, which lets its decaying refuse-matters gather about it.

Cleanliness not possible for communities, except with method and organization for certain collective services.

25.—Wherever human beings are settled for residence, the cleanliness which is indispensable for healthy life can only be secured by strict method. Even where houses stand single and with wide space around them, the householder cannot safely neglect that sanitary obligation in regard of the refuse of his one household: the slop-waters, the cooking-waste, the various house-sweepings, the human fæces and urine, the excrements of domestic animals, &c.: and the obligation becomes more and more important in proportion as dwellings are gathered together on comparatively small areas.

The law does not allow any holder of premises, whether in town or country, to neglect that obligation to any injurious extent; and it is the express intention of the law that each local Sanitary Authority, rural or urban, should in its respective district see strictly to the enforcement of the obligation, and give all proper aid to its due fulfilment. Each Authority is bound by law to see that the drains, water-closets, privies, and ash-pits in its district are so constructed and kept as not to be a nuisance: and with reference to these and various other matters of concern to health, each Authority is bound by law to make from time to time (either by itself or its officers) inspection of its district for the purpose of ascertaining what nuisances exist calling for abatement under the provisions of the Nuisances Removal Act, and the Authority must enforce those provisions against the nuisances. In order that residents may have necessary common facilities for disposing of their refuse, the Authorities are bound by law to make such sewers as may be necessary for effectually cleansing and draining their districts: and they may either themselves undertake or contract for the removal of refuse from premises and the cleansing of privies, ash-pits, and cesspools, or may make bye-laws imposing these duties upon the occupiers of the premises.

In the detailed application of the law different districts and parts of districts require, at the hands of their Authorities, a management graduated according to circumstances: certain circumstances requiring only the general supervision of the Authority, while others require, in higher and higher degrees, that the Authority should itself intervene and operate. The holder of outlying rural premises, will generally be able to consume his own refuse-matters satisfactorily on his own or some closely adjacent land: and the sanitary Authority, in regard of such cases, has only to make sure that the essential objects of the Nuisances Removal law are attained. Even here, however, it will always be requisite to see, as regards labourers' cottages and other like cases, that refuse is not thrown or accumulated in situations where its effluvia or soakings can be offensive or injurious; and the relation of privies, piggeries, cattle-stalls and dung-heaps, and of their several outflows, to the walls of dwellings and to sources of water-supply, must always be cautiously observed. In proportion as dwellings are aggregated, and populations increase, in villages, towns, and cities, it becomes more and more difficult for refuse to be properly disposed of by the separate action of individual householders. In very early stages of such aggregation, the Authority finds itself called upon to provide common sewers for the joint liquid refuse of the localities, and more or less common scavenging, not only for the public ways but in aid of the defæcation of private premises; and these collective services require to be more and more developed in proportion as populations become more and more urban. In proportion as such facilities are not given, more and more vigilance is wanted under § 20 of the Sanitary Act, 1866, to see that nuisance do not arise from individual mismanagement of house-refuse,—that, in places unprovided with sewers nuisance be not caused by slop-water,—that, in places where water-closets are impossible, nuisance from bad privy-management do not exist,—that, in places to which scavenging does not extend, nuisance from filth-accumulation do not arise on individual premises. On the other hand, with the growth of the collective services, the Authority more and more finds that (greatly to the advantage of the public health) it has become the preventer rather than the remover of nuisances; and so universally is this the fact that, bearing it in mind, Sanitary Authorities, when proceeding to think systematically of their duties, will generally find it advantageous to regard the prevention rather than the removal of nuisances as their main administrative problem.

Removal of refuse has two main divisions: sewerage and scavenage.

26.—Sewerage and scavenage between them have to do all the work of each Local Authority in carrying off the refuse of the district: the privy-refuse, the ashpit-refuse, the slop-waters, and in certain cases trade-refuse and the refuse of domestic animals. Sewerage and scavenage—assisted, as regards the matters which are within their range, by proper bye-laws, and supplemented, as regards the matters which are outside their range, by proper enforcement of the law against nuisances,—they, thus assisted and supplemented, and of course with adequate supply of water, are the two essential agencies of all local cleanliness. In proceeding to settle any scheme for their local application, the question first to be decided is, which of the two is to deal with privy-refuse;

but whichever way this decision is to go, a clear view must always be had as to the eventual disposal of both sorts of refuse.

All disposal of refuse-matters must be so managed as not to make nuisance.

27.—All Local Authorities collecting refuse-matters, whether by sewerage or by scavenging, have of course to dispose of them in ways which shall not cause, or shall cause as little as possible, any nuisance in relation either to air or water: and this (sometimes difficult) obligation is at present urging itself on the notice of many Local Authorities as virtually a new problem with regard to the outfalls of liquid refuse. The obligation, not to cause nuisance by sewage outfalls, exists in an infinite range of magnitudes: from the vast sewage-tunnels of London on the one hand to the little village-sewer and its occasional flushings on the other; but, whether as to village slop-waters or to great urban sewage-floods, equally it has to be provided that no avoidable atmospheric nuisance shall be produced by the outfall, and that all natural water-courses (or at least all such as may be giving domestic supplies) shall be protected as far as practicable from pollution. Along the coast-line of England there may be cases in which those conditions will be most conveniently and cheaply attained by letting the sewage run as mere waste (subject to such precautions and with such engineering arrangements as may be necessary) into river-estuaries or into the sea: but this course, in the cases where it is possible, is not by any means necessarily to be preferred: for sewage contains the essential elements of fertilisation for land, and land ought always to be considered its proper destination except where from particular local circumstances this use of it would involve too much cost to be profitable. In the large majority of cases throughout England an option of entirely wasting sewage as above does not exist: on the contrary, the obligation not to cause nuisance by sewage-outfalls will be found in general to involve as its consequence that the sewage must be purified by land; which generally will in return by increased fertility yield more or less pecuniary set-off against the cost of such constructions and service as the use of that method of sewage-disinfection may require. Evidently, then, the management of sewage-outfalls is a matter for serious consideration by Local Authorities: so that on the one hand each inhabited area may best eliminate every sort of fluid refuse which it produces, and that, on the other hand, the required prevention of outfall-nuisances may be economically as well as effectually attained. To improve public knowledge on the means of attaining those objects has for many past years been the object of continuous elaborate study under successive Royal Commissions; and it is to be desired that all persons who have to deal responsibly with the disposal of refuse-matters should be acquainted with the practical conclusions to which that study has led, as particularly represented in the very valuable reports of the Rivers Pollution Commission, 1868.

Disinfection of sewage.

28.—As regards means for disinfecting sewage the Commission reports that purification in such degree that the outflow may properly be allowed to pass into the running waters of the country, can be got under certain conditions by the action of land upon the sewage, but not in any other practicable way; and that, in order to the required action of land on sewage, two methods are available: the method by *agricultural irrigation* and the method by *intermittent filtration*.

Of these two methods neither can in practice be so applied as not to include some participation of the other: for filtering beds have of course more or less irrigated surface, and irrigated fields have of course more or less downward filtration: but, except so far as there is this accidental overlapping, the methods contrast with each other in respect of the natural forces to which they chiefly appeal; and, while they both effect the purification of sewage, their collateral results are widely different. The irrigation-method bases itself on the *appropriative* action which a certain surface of cultivated land with growing crops on it exerts over organic matters supplied to it as manure: the case for it exists in proportion as there is suitable land in the comparatively large extent which suffices to utilise to the utmost the fertilising power of sewage: and the intention is that this land, while disinfecting the sewage, shall also yield adequate pecuniary return in irrigated crops. The filtration-method, on the contrary, bases itself on the *destructive* influence which a certain cubic quantity of well-aerated porous earth, receiving organic matters at intervals on its surface, and discharging them below, will exert on them as they gradually sink (followed again by air) through its thickness: it requires plots of suitably-placed porous land, deeply under-drained, to be used in rotation as disinfecting-ground for the sewage delivered on to them; and the method is such that, though more or less vegetable produce may be obtained from the comparatively small area of land which suffices for these filtration-plots, the fertilising powers of the sewage are of necessity in great part sacrificed.

In view of the sanitary intention of these processes, Local Authorities adopting either of them must, of course, see that it effects its proposed action completely, and that it does not cause any nuisance of its own. In choosing localities for irrigation or filtration, in designing the works for either purpose, and in the day-by-day management of such works, every possible care must be taken that all populations within range of influence of the works shall be safe from injury, whether through air or through water; and as regards the latter, it must be particularly cared for that the quantity of land, and the details of the application of sewage to it, shall be such as will, under all variations of seasons and weather, always effectually purify the sewage before it can have access to any watercourse. The standard of the Rivers Pollution Commission, on the presumption that rivers are not to supply drinking-water, is, that irrigation-land at the rate of at least an acre for every 100 of the population, or filtration-land at the rate of an acre for every 3,000 of the population, will give to sewage such degree of purification as to justify its being allowed to pass into rivers; but with what least quantity of land (properly used) the purification of sewage will be so complete that the out-flow of the land shall be safe drinking-water, is a question which has yet to be answered by local experiences.

Limits of the utility of sewers, as

29.—Among the conclusions of the Commission, there are two which may particularly assist the judgment of Local regards what must, and what may be conveyed by them.

Authorities as to getting full use of sewerage in populous places. First, namely, with reference to the present state of the case as to excremental refuse, it appears that the ordinary sewage-problem as to the means of preventing nuisance from the outflow of populous places, is not materially lighter in places where water-closets are few or none, and where systems which purport to withhold privy-solids from the sewers are in use, than it is in places where water-closets are general. It appears that in all places of the former class the sewage has in fact under the existing arrangements universally received a very large proportion of human refuse: and that apparently the mere house-slops and street-washings of populous places (not to mention other sources of pollution) must in themselves, under any conceivable system, constitute a highly offensive outflow, requiring substantially the same treatment as the sewage into which water-closets empty. And secondly, the Commission reports that, for populous places which are also seats of manufacture, it would generally be possible, without materially complicating the sewage-problem, to allow the fluid refuse of industrial processes, with few exceptions, to pass into the sewers to be disposed of as common sewage: the special exceptions which are named being the refuse of workers in metal and of manufacturers of gas, paraffin oil, pyroligneous acid and animal charcoal: that, subject to some such exceptions as these and to proper regulations, the discharge of fluid industrial refuse into sewers would generally not render the sewage more difficult of use, and would in some cases, in respect of certain contained refuse-matters, greatly increase the agricultural value of the sewage.

Sewers and drains as means of cleanliness.

30.—Of sewers and drains, with regard to the technic of their construction, I of course do not pretend to speak. All rules applicable to this matter are given in a special Memorandum issued by the Board for the assistance of local officers, which, as having been prepared by Mr. Rawlinson, the Board's Chief Engineering Inspector, has the authority of an unequalled experience; and my reference to sewers and drains is only in regard of their sanitary results. In proportion as they are skilful or unskilful appliances, so they become powerful influences for good or for evil; and in this point of view, I would urge the necessity of such works (even though on the smallest scale) being always planned with adequate skill and executed under trustworthy supervision. In the same point of view I would also urge the importance of using as channels for liquid refuse none but properly constructed sewers and drains, and of therefore superseding by such constructions, as soon as practicable, the many now existing mere gutters, or ditches, or rude irregular works of brick or stone, which, originally meant only for rain-water, are incapable of fulfilling in an effective, cleanly and wholesome manner, the purpose for which modern sewers are designed. This recommendation applies not only to cases where the channels receive privy-drainage, but likewise (for reasons previously explained) to cases where they receive only slop-water: and equally in both cases it must be provided that any sewer which is not completely self-scouring shall at due intervals have effective flushing. With regard to the smaller relations of the subject, as represented in the collection of village-slops, useful information will be found in an appended report by Mr. Netten Radcliffe (to which I shall hereafter more particularly refer) on means of preventing excrement-nuisances in towns and villages.

Shall water-closets be adopted?

31.—The choice between a water-closet system and a system of so-called dry-privies, is necessarily in each case a question for local judgment on grounds which in great part must be purely local.

Their advantages where certain conditions can be fulfilled;

32.—The advantages of the former where it can be adopted and will be properly worked, are—as regards the supremely important object of getting the refuse continuously and completely removed, too evident to require advocacy. Those advantages however may fail to be realised if the system be adopted without due circumspection; and the conditions which ought to be kept in view in order to avoid any such failure are apparently these three:—

first, that the closets will universally receive an unfailing sufficiency of water properly supplied to them;

secondly, that the comparatively large volume of sewage which the system produces can be in all respects satisfactorily disposed of; and,

thirdly, that on all premises which the system brings into connexion with the common sewers, the construction and keeping of the closets and other drainage-relations will be subject to skilled direction and control.

as to water-supply;

(*a.*) The water-supply of a place should not be deemed sufficient for a system of water-closets unless it be such that each ordinary water-closet can be flushed as often as it is used. If the supply be professedly "constant" it must be really constant, subject only to the occasional short interruptions which may be necessary for repairs and the like, and against the possible dangers of which proper precautions must have been adopted; if, on the contrary, it be confessedly intermittent, and therefore require domestic storage of water, the supply of water (sufficient to fill all house-cisterns) should be at least once in every period of 24 hours; and in any case proper mechanical arrangements to prevent waste of water and to secure the water-pipes against entrance of privy-air will be necessary.

as to sewers;

(*b.*) In order to a satisfactory discharge of privy-sewage, properly constructed sewers, with properly located outfall, are of course indispensable: sewers which would also convey the slop-waters, and generally the rain-fall, or more or less of the rain-fall,* of their drainage-area. It may sometimes be the case that sewers already existing and in all respects satisfactorily working as provision for slop-waters and surface-drainage, are of such construction and with such outfall-arrangements as to be suited also for the addition of privy-sewage, or capable at very moderate expense of being rendered so: for as slop-waters partake (in greater or less degree) of the offensive qualities of privy-sewage, sewers which are to convey them require the same sort of care as to construction and outfall-arrangements as if privy-sewage were also to be conveyed. If existing slop-water sewers are offensive or inefficient in the service in which they already act, or if their outfall is such as already to cause nuisance or water-pollution, evidently no such additional service as the conveyance of privy-sewage can be claimed of them in their actual state: but in this class of cases (and according to the degree of offence or inefficiency) the local sewerage would be judged to require reform, even apart from any question of water-closets; and in connexion with any such reform, especially in towns which have or ought to have common waterworks, there will be favorable opportunity for considering whether a system of water-closets should be adopted.

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* In some districts special arrangements for the discharge of storm-waters may be necessary; and in some it may be desired to effect as far as practicable a diversion of all clean rainfall from the sewers: but the consideration of questions of this sort will be special to the localities where they arise.—J.S.

as to communications;

(*c.*) No premises ought, either through water-closets or in any other way, to be brought into drainage-connexion with common sewers unless they can be made reasonably secure against the dangers of sewage-infection. Part of such security would consist in the fact of the sewers themselves being such and in such state as they should be, especially with regard to scouring and ventilation; but a further, very essential, part would depend on the proper situation, construction, and keeping of the drains and drain-inlets of individual premises. In this latter respect, the following conditions ought to be insisted on:

that every private drain be properly trapped and ventilated in relation to the common sewer, and be itself also properly constructed;

that every private drain, having inlets within a house, have ascending from its head or heads into some suitable high position in the open air, and where it cannot infect the interior, a ventilating-pipe or ventilating-pipes of sectional area amply proportionate to its own;

that all slop-water pipes from within houses be provided at their sinks or other inlets with fixed traps, but further, that, as far as practicable, they be separate from privy-pipes, and made to open over trapped drain-gratings outside the house, not direct into privy-pipes or drains;

that no overflow-pipe from any cistern which furnishes domestic tap-water, nor from any cistern inside a house, be allowed to open directly into any drain or privy-pipe, but be made (as above) to end open in the outer air;

that in cases where water-closets are supplied on a "constant" system, and where generally there will not be storage-cisterns, the entrance of privy-air into water-pipes be prevented by the adaptation of special service-boxes (which also will act as waste-preventers) to all such privies as have not cisterns.

as to users;

(*d.*) In considering the admissibility of water-closets, it has always to be remembered that the working of an ordinary water-closet is easily deranged, and that water-closets, when out of order, and especially if in the interior of houses, are apt to become very dangerous nuisances. The ordinary water-closet is therefore a thoroughly ineligible form of privy for those who are unlikely to take proper care of it, or are from poverty unable to give it such occasional repairs as it may require.

as to location.

(*e.*) Among such classes of population it is of course unfit that any form of in-door privy should ever be sanctioned: but even in the best-ordered houses the occasional danger of in-door water-closets must not be disregarded. Water-closets ought never to stand where they cannot have outside windows: they ought if possible to stand as projections from the body of the house, and with windowed lobbies dividing them from it.

Where water-closets not to be adopted, what are the best alternatives for cleanliness?

33.—It must be assumed that, even in large towns, Authorities, exercising their discretion on skilled advice given to them, will sometimes pronounce against the local adoption of a system of water-closets; and even if it be assumed that the number of such cases will eventually be small, yet, at least for the present, great importance attaches to the question of other means by which privy-nuisances in large towns can be prevented. And it is the more necessary that all such means should be well understood and as far as possible perfected because permanently it must at any rate be the lot of many small towns and of most villages to depend on them rather than on water-closets.

In a former section of these observations I described at some length the extremely filthy and dangerous arrangements which frequently, or I fear I should say generally, exist in places where water-closets are not in use. Modern experience, however, has shown, and the fact is of the highest sanitary importance, that such arrangements are not the necessary alternative to a system of water-closets; but that, failing a water-system, both large and small populations can obtain under other and amended systems of privy-management a complete or comparatively complete freedom from excremental nuisance and injury.

Former and present departmental inquiries.

Evidence to that effect was given five years ago in two most valuable papers which I had the honor of submitting to my Lords of the Council as appendices to my 12th Annual Report: one by Dr. Buchanan on the earth-closet system, the other conjointly by him and Mr. Netten Radcliffe on the privy-systems of various northern towns; and from that time till the present the information collected in these two reports has been the basis of all advice which I have given in the matter to which they relate. Recently, under the Local Government Board, the present state of experience in the same important branch of nuisance-prevention has been made matter of new and large investigation by Mr. Netten Radcliffe; and I have the honor of submitting to you [A] his comprehensive and thoroughly practical report on the subject.

Mr. Netten Radcliffe's present report.

34.—The improved systems which Mr. Netten Radcliffe describes start universally with abolishing all such filthy catchment-provisions as I have referred to, and then, in order to meet the sanitary requirements, provide more or less as follows:

Pail-Privies: having as their aim that excremental matter, unaltered, shall be removed from the privies at so short intervals as not to have become offensive; and adopting as means to this end the use of moveable receptacles, which systematically at short intervals are to be changed, clean for dirty, by the scavenger; and which, for the prevention of nuisance in this process have close-fitting air-tight lids to be applied to the foul pails under removal.

Ash-Privies: wherein the professed purpose of the north-country midden (to deodorise excrement by covering it with dry house-refuse) is, under strict precautionary conditions, accepted; the intention being, that the space beneath the privy-seat (but no further space) should be converted by careful masonry into a non-porous catchment-chamber, planned in slope and otherwise with particular reference to ease and frequency of systematic scavenging, and necessarily of but small size; and into which chamber, and direct upon the excrement, the ashes of the house are to be thrown, either down the hole of the seat, or with the seat hinged and lifting for the purpose, or otherwise.

Earth-Privies: as introduced by the Rev. H. Moule: purporting to effect under strictly defined conditions such applications of earth to excrement as shall render the latter inoffensive, forming with it a manure which not only can without offence be stored where it is produced, but can also, after being stored and dried, be used in the privy again and again with the same effect as new earth, and with some progressive increase of manurial value.

Charcoal-Privies: intended to utilise, on the general plan of earth-privies, the still higher disinfectant powers of charcoal, and thus to reduce to a minimum the quantity of disinfectant required: and purporting to have the further advantage that the excrements themselves can be made contributory to the supply of the charcoal.

In certain cases, Local Authorities have special responsibilities as to privies, viz.:

35.—With general reference to the duty of filth-prevention in inhabited areas, it is necessary to observe that the actual management of privies tends to become a function of Local Authorities, first, in proportion as dry privies of any kind are in use in their districts, and, secondly, in proportion as the districts contain dense settlements of ignorant and dirty population.

where dry privies are in use;

(*a.*) The dry systems, if they are to be generally available in any populous district, must always be vigilantly superintended, or in most cases actually managed, by the Local Authority, and must be managed with forethought and competent skill. The Authority must in the first place decide as to the type of construction to which it will require householders to conform in regard of the placing of privies, and in regard of the plan of their privy-fixtures: not allowing privies to be so placed that the use of them will be a nuisance to houses or will make the privy-scavenage needlessly difficult or offensive, and carefully regulating the plan of the privy-fixtures (whether for earth-privy, charcoal-privy, pail-privy, or ash-privy) in the ways best calculated to prevent nuisance and facilitate scavenging. If the earth-system be adopted the Authority must prepare and supply the earth; if the pail-system be adopted, the Authority must supply the pails; and whether earth-system, pail-system, or ash-system, be adopted, the Authority must (except in individual cases) scavenge the privies and dispose of the refuse which is removed. Pail-privies and ash-privies in towns should be scavenged as far as practicable daily, and even where the population is least dense, at intervals not exceeding a week. Whether the Authority in acting as above shall act through its own officers and servants or through contractors will be a matter of local discretion; but, so far as it acts through contractors, it must of course see strictly to the execution of the contract, and in all cases it will have to make such bye-laws as are wanted to give effect to its system.

and where poor populations are thickly aggregated.

(*b.*) Sometimes even in country districts, but with more and more frequency in proportion as districts are urban and populous, particular poor neighbourhoods require that their privy-accommodation, whatever be its sort, should be specially cared for, and sometimes (which must be under urban powers) actually provided by the Authority.

Construction of privies for large joint use by lowest class;

(*c.*) Though ordinary water-closets (and particularly within doors) are not proper for the use of dirty and ignorant populations, water-closets, specially constructed with regard to such classes of population, and managed or constantly superintended by the Local Authority, seem the best of all yet discovered privy-contrivances for the uncivilised quarters of towns: and in this respect the experience of Liverpool deserves attention, as shewing that freedom from privy-nuisances can be attained in even the lowest of urban quarters on condition that a proper system of trough water-closets is managed by an efficient Local Authority.

and the supervision of such privies.

(*d.*) Whenever privies of any kind are used in common by many families, or are for general public use, it is essential that the Local Authority should have them under constant supervision, and that (whether they are or are not of a sort to require scavenging of contents) the cleanliness of the privy itself should be systematically and strictly cared for. In cases where the use of the privy is common to all comers, servants of the Authority must of course keep it clean: and in cases where the use is common only to a defined group of houses or families, a definite understanding should be had as to the performance of the duty, either by the using families in regular rotation, or by their landlord or someone else on their joint behalf; and some appointed officer of the Authority must see strictly to the performance of the duty. Also in either case the privy must be protected against wilful damage, and wilful or negligent fouling: and vigilance should be used (particularly when the privies are first coming into local use) to detect, with a view to future prevention, any such abuses of the convenience.

Cleanliness as regards (so-called) dry refuse;

36.—In cases where the water-closet system is in full work, and where consequently no excrement-removal has to be done by cart, necessity still remains (at least in populous places) for a certain quantity of other scavenging. In order that nuisance shall not arise from the so-called dry refuse of houses, regularity and frequency of removal are first conditions; and in populous places such removal needs, of course, to be done as a systematic act of the Authority.

must advert to the putrescent quality of parts of it;

(*a.*) It has to be assumed that the dust-heap of each household contains almost invariably more or less of decomposing moist organic matter: the refuse or professed refuse (often far too lavishly so professed) of the different comestibles of the house: the peelings and other waste-bits of vegetables, the guts and other waste-bits of fish or birds, and so forth: and the necessity for frequent removal has to be estimated, not by what the mere fire-ash and other dry dust would require, but by the extreme offensiveness of these usual adjuncts. Households, not of the poorer classes, can, with proper management, keep their dust-heaps comparatively free from organic refuse: the larger households, namely, by daily utilisation of their kitchen-waste, and many smaller households by burning theirs on the kitchen fire. But the moderate amount of care which would serve in these ways to prevent nuisance is in a large proportion of the cases absent, and in other cases, immensely numerous, the suggested prevention would be quite impossible: for the domestic power of burning refuse is limited by the poverty which must spare fuel, and many large towns have masses of poor population to whom such fires as would consume even the scant potato-peelings or spoilt cabbage-leaves of the house are luxuries entirely unknown. Scavenging-arrangements in relation to house-refuse in towns must therefore be framed with special reference to the fact that such refuse soon becomes highly offensive, and that, except where good domestic management exists, any two-days' retention of it makes a nuisance. It has to be remembered too as an actual fact, though representing a state of things which ought as far as possible to be resisted, that so-called dust-heaps in poor neighbourhoods very often contain some, and not rarely a good deal of excremental matter: cast there sometimes in mere dirty indolence, and sometimes because of a shameful want of other privy-accommodation.

must not let it accumulate or get wet;

(*b.*) House-refuse, awaiting removal, ought especially not to be exposed to wet. Liquids of course ought never to be thrown with it; and the ash-heap or fixed or moveable receptacle, used for ashes, ought always to be protected against rain. A moveable ash-tub, standing under a shed, is perhaps generally the best receptacle for dry-refuse, is particularly suited to the crowded parts of towns, and is the only proper arrangement for cases where the refuse must be carried through the house. If a fixed dust-bin be used, its walls should be smooth and impermeable, and its location and construction such as to give every facility for sweeping out. No receptacle should be of unnecessary size, but merely large enough to contain such accumulations as must occur in the proper intervals of removal.

may in some cases advantageously burn it.

(*c.*) It is not requisite in this place to say anything with regard to the eventual utilization of dry-refuse. But it may be convenient here to note, with regard to cases where utilisation is not in view, that accumulations of offensive refuse may sometimes advantageously be burnt: namely, with the addition, if necessary, of lime, ashes, or other drying material, and with an admixture of cinders or small coal: and that this process (which gives an ash useful for deodorisation) may, in proper situations, be conducted either in coking-ovens, or in suitably-disposed open heaps.

Cleanliness as regards public ways;

37.—I perhaps hardly need note that the due scavenage of public ways is among the requisites for such local cleanliness as the public health requires. The filth of ill-kept streets contains, with the inorganic detritus of road and wheels, large quantities of the dung and urine of horses and occasionally other cattle: while in the courts and alleys of poor neighbourhoods, and even in many obscure streets, the case is made worse by an admixture, sometimes not small, of human excrement: and it is therefore essential that street-refuse should share the general obligation of filth to be promptly and properly removed. In quarters which will admit of it (and especially in poor neighbourhoods) the use of the hose in aid of the shovel and broom may be of great service.

and the sanitary importance of good pavement.

Public ways cannot be kept clean unless they are of suitable surface (so paved, namely, as not in any avoidable degree to favor the imbibition or other retention of filth) and are provided with proper rain-channels. In poor neighbourhoods this requires special attention: the extension of good pavement into all courts and alleys, whether legally public or private, is essential to their means of cleanliness: and generally with regard to all yards and curtilages, whether of rich or poor, the provision of impervious pavement on ground which adjoins houses is a valuable security in the same direction. The same rule applies to the basement of houses in regard of parts on which slop or other dirt is apt to fall.

Cleanliness as regards offensive sorts of

38.—The general sanitary obligation to prevent injurious action from refuse-matters includes of course that sufficient business, and the keeping of animals.

regard shall be had to the conduct of those sorts of business which produce animal or vegetable refuse, or are in any other way apt to give putrescent effluvia or putrescent outflow. Thus, for instance, slaughtering-places, whether in towns or in villages, always require particular attention, as to their means of water-supply and drainage and ventilation, as to their having proper receptacles and regular prompt removal for all their refuse-products, as to their not occasioning any filthy soakage within or without their limits, and generally as to their being kept in a clean state and (as far as can be) without offensive odor. So of course, in populous places, all keeping of animals requires to be looked after with reference to the due removal of the refuse, and with reference also to animals not being kept (as great numbers of pigs often are) in situations so contiguous to houses that their keeping must necessarily be a nuisance: and, whether in towns or villages, no offensive outflow or soakage should be allowed from any cattle shed or pig-sty which would not be allowed from a human privy. The action of Local Authorities, or of contractors under them, in collecting and disposing of the solid house refuse and surface-filth of districts, requires, of course, the same sort of care as other sorts of business which deal with putrescent matter; as particularly as regards places of temporary deposit for collected refuse, and processes which the refuse may there have to undergo, the sites should be so chosen, and the processes so conducted, as not to cause avoidable nuisance.

Abatement of refuse-nuisances when found existing.

39.—In a different point of view to that of the preceding observations, I have yet to mention one more function which has to be discharged by those who would reduce the prevalence of Filth-diseases in England. In an earlier page I noted that, in proportion as a district should be well cared for in such respects as have now been explained, nuisances would so largely be prevented in it that comparatively few could present themselves for removal. Exceptionally however even under such circumstances, and abundantly of course in districts which have been ill-cared for, the abatement of various refuse-nuisances, and particularly the removal of accumulated refuse, is a duty which has to be performed in order (so far as may still be possible) to the prevention of disease; and I have therefore here to advert to it in that sense.

With reference to houses which are said to have offensive smells, or which Inspectors find in a stinking state, it cannot be too distinctly understood that cleanliness and ventilation and dryness are the proper deodorisers of houses, and that artificial deodorisers will no more serve in their stead than, in regard of persons, perfumes could serve instead of soap and water. As against old frowsy and mouldy states, something supplementary may be got by free washings with hot lime-wash, or, in close spaces, by fumigation with sulphurous acid: but truly to deodorise a house is, to see that no house-refuse (not only no excremental matter, but also no other kind of dirt or refuse, nor any foul old wall-papers or other hangings) remain in or about it; and to see that all proper washings and limewashings be duly done; and to see that its basement be thoroughly dry; and to see that the air within it be not in any part stagnant, but always in course of renewal from without. Similarly, where the complaint is of drainage-odor within a house, search should be made whether the filth which house-drains are meant to carry away is retained in or near the premises in ill-made drains or in cesspools, or perhaps is leaking from house-drains within the house; or whether, inside the house, the inlets of drains and sinks are not properly trapped, or the pipes themselves have holes in them; or whether, outside the house, the ventilation of the drains and sewers is insufficient.

Where offensive matters have been allowed to accumulate in large quantities, the disturbance of them for removal (as in the emptying of ill-conditioned privies or cesspools) ought to be with special precautions; both in order to reduce the mere offensiveness of the process, and also to obviate, as far as may be, the dangers which the effluvia may represent. For the latter purpose, chemicals of an antiseptic sort are perhaps those which will be most generally applicable, and may be such, or in such combination, as also much to deodorise the filth; but, for the limitation of stink, privy-refuse should, at least in populous places, always be removed with special apparatus. Various refuse-heaps and mud-heaps, which for a time it may be impracticable or inexpedient to remove, should be covered, to the depth of two or three inches, with a layer of freshly-burnt vegetable charcoal in powder, or with a layer of clean dry earth, or with a layer of freshly-burnt lime; and earth near dwellings, if it has become foul by the soakage of decaying or vegetable matter, should be treated on the same plan.

Cleanliness as regards water supply;

40.—Finally, it will be evident that, as the use of impure water is a chief way by which filth-infections get entry to the human body, so, for the prevention of filth-diseases, a very strict insistence on purity of water-supply is quite essential. And this in my opinion is a matter with regard to which no sort of compromise should be considered safe. When proper local arrangements shall have been made for dealing with the excremental and other organic refuse-matter of inhabited places, many water-supplies which now are a daily danger to life will through that reform become comparatively safe: streams namely at once, and wells after sufficient lapse of time; but I venture to repeat that in this matter a very strict standard of cleanliness is in my opinion essential to safety.

from streams;

As regards running waters, the reports of the Rivers Pollution Commission seem to have clearly shewn that the fouling of natural watercourses by direct infusion of liquid refuse is a nuisance which, at least in all ordinary cases, Local Authorities may reasonably be required to suppress by application of the sewage to land; and though conditions are not yet defined under which streams, otherwise safe as drinking-water, can, without detriment to their potability, receive the outflow from sewage-receiving land, it may, I think, fairly be expected that to fulfil satisfactory conditions in that respect will in general be of no insuperable difficulty. Whether in particular cases populations may be so circumstanced that they cannot refrain from polluting streams, is a question which would in each separate case have to be judged on its own merits: only, if they must pollute the water, let the water be frankly recognised as unclean. Thus, regarding rivers as sources of drinking-water, one of two positions ought, I submit, to be consistently aimed at: either that, being a necessary source of domestic water-supply, the river shall be absolutely protected against pollution; or else that, being (in whatever degree) used as a sewer, it shall be classed as not fit to supply drinking-water.

from wells;

As regards wells, two cases must be distinguished. In the case of densely inhabited areas, it is certain that, however rightly the refuse-disposal may be conducted, the surface-wells can never be other than most dangerous sources of supply; and deep wells (which of course can only be trusted on condition that they are demonstrably protected against the chances of downward pollution) are only possible under certain geological conditions. It must therefore often be, that considerable centres of population will not be safely supplied with water unless the water come from outside the inhabited area; and in regard of the origin and course of any such extrinsic supply, the town population ought to be extremely vigilant. Among comparatively scattered populations, wells (and in great part surface-wells) must often be the source of supply: and it is of the greatest importance to discriminate between such as may and such as may not be safely used, and to ensure for all those which are to continue in use the completest attainable protection against dirt. Wells, adjacent to such privies and other filth deposits as are now common in rural districts, are probably at present the chief means by which enteric fever spreads in such neighbourhoods; and however much the system of refuse-disposal in such districts may be improved, it can scarcely be hoped that surface-wells contiguous to dwellings (such as particularly the shallow dip-wells attached to cottages) will ever be safe against pollution. It is therefore greatly to be desired that, in each village, there should as far as practicable be common centres of supply; if possible, springs or deep wells; and, in any case, with the most careful protection against foulings by slovenliness or by accident. In rural districts which (for geological or other reasons) cannot have safe water-supplies by springs or wells as above, arrangements for the collection and storage of rain-water, with every possible care that the water shall be collected and stored without pollution, are necessary to meet the wants of the population ; and the receptacles which must be part of any such system ought, if practicable, to be above ground.

Reminder, that the preceding observations have aimed only at one group of removable causes of disease.

41.—Throughout the above observations I have always, I hope, sufficiently shewn that, while regarding Filth as the deadliest of our present removable causes of diseases, I am far from regarding it as the only evil influence against which Sanitary Authorities have to contend ; and though the object of my present Supplementary Report has been only to advert to the means by which enteric fever and the diseases ætiologically akin to it may be prevented, I would in conclusion observe, that, however admirable may be local arrangements of sewerage and scavenage and water-supply, and however complete in consequence may be the extinction of the diseases which arise exclusively from Filth, other excesses of disease will still have to be extinguished by such other preventive measures as are appropriate to their modes of production. On that subject I do not here pretend to enter : but having above (§ 5) specially named one influence as being, like Filth, of most destructive and probably universal operation throughout England, I would here specially, though but in a word, revert to it. And as regards that deplorable facility with which dangerous contagions of disease are allowed so generally to diffuse themselves in this country, often no doubt by co-operation of Filth, but also often independently of it, I would finally urge, as of interest to all districts, that, side by side with such endeavours for strict cleanliness as it has been the object of my preceding observations to recommend, the utmost vigilance should likewise everywhere be used with regard to all first cases of infectious disease, and everything be done, which the state of the law permits, to prevent the scattering of seeds of contagion.

Annual Report of 1875*.

TO THE RIGHT HONOURABLE THE PRESIDENT OF THE
LOCAL GOVERNMENT BOARD,
&c. &c. &c.

SIR,

IN accordance with the Statute under which I have the honour to act, I submit to you the following statement with regard to proceedings of the Local Government Board in the year 1874 in matters concerning the Public Health.

I beg leave to premise that during 1874 the Medical Department of the Board had less than usual working-power for the purposes to which this Report will relate; principally, because (for temporary reasons) one of the inspectorships was being applied to the Poor-Law purposes of the Board; but partly also, I regret to add, because two of the staff were interrupted in their work, each for several weeks, by illness; and partly, too, because one of the staff had to attend, and this likewise for several weeks, at an International Sanitary Conference held at Vienna.

The proceedings which I have particularly to describe, as taken by the Board through the Medical Department, are of two sorts:

one, not of an immediately administrative intention, but having for its immediate aim to collect and methodise information, wanted for general public use or for the increase of the Board's own efficiency, with regard to moot sanitary questions on which the Board has to advise or direct;

the other, on the contrary, consisting in practical communications with Local Authorities, with an immediate view to the better prevention of disease in each of the respective jurisdictions.

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* Reports of the Medical Officer of the Privy Council and Local Government Board, New Series, No. IV.

I.

I. *Non-administrative business.*

1. Studies of Nuisance Prevention.

1. Under the first head I have to report that in 1874 Mr. Netten Radcliffe visited 49 carefully-selected places in Great Britain, including on the one hand several of the chief centres of population, and on the other hand several country-places, with a view to collect all best contemporary experiences as to the means of preventing Excrement-Nuisances in towns and villages. Mr. Radcliffe's report, when complete, seemed to me to have so much immediate interest for local Authorities who might be in difficulty on the matters to which it refers, and was also so essentially connected with the subject-matter of my Supplementary Report of last year —the subject namely of Filth-Diseases and their Prevention, that I asked and was favoured with your permission to annex it to that report, presented to Parliament at the end of last session, instead of keping it back for this year's presentation. As I have already in that connexion turned to account the valuable contents of Mr. Radcliffe's report, I need not now further advert to them; but I would beg leave to express my grateful sense of the service which Mr. Radcliffe rendered, in devoting himself for many months with indefatigable patience to details which only the hope of real public usefulness could make attractive.

2. Foreign Epidemics.

2. As another non-administrative work of the Board in the Medical Department, I have to refer to the cognisance which is kept up of the progress of Foreign Epidemics; partly with regard to any existing possibilities of their extending to this country or its dependencies, and partly with reference to the quarantine-conduct of other countries. In this branch I have of late years had constant assistance from Mr. Netten Radcliffe, who notes for the office all information received from Her Majesty's Indian, Colonial, and Foreign Secretariats, with regard to the epidemics and quarantines of other countries. In 1866, when submitting my 8th Annual Report to the Privy Council, I presented a report by Mr. Radcliffe, bringing down to that date an account of such foreign

movements of Cholera as were of interest to this country; and Mr. Radcliffe is now compiling a continuation of that account in a paper which I hope shortly to lay before you in a supplement to the present report.

As regards the foreign epidemics of 1874, I am glad to be able to report further subsidence of the continental Cholera-wave which was seriously threatening us in 1871 and 1872, but has since that time been retreating, and appears now to be at its lowest ebb. On the other hand, I have to state that during 1874 Levantine Plague came into unusual mention in some of the foreign correspondence: that in one of the Yemen provinces of Arabia, among the high-lying villages of the Assur country, which had been visited by the disease in 1816 and 1853, there were considerable outbreaks of plague in 1874; that in Tripoli, too, a small outbreak of plague again affected the encampments of Benghazi, where already there had been an outbreak in 1858; that in the lower Euphrates Valley, where the Hindieh marsh-country had had an outbreak in 1867, the Afij marsh-country (on the opposite side of the river) suffered in 1874 a severe outbreak; and that, at least of the last, the consequences are not yet ended: for the disease spread in both directions, from Kerbela to Samawa, producing very large mortality, and at the date of my present report is still continuing.* Plague has now for so long been comparatively unknown in the countries where it used to be most fatally endemic, and European interest in it has in consequence become so nearly obsolete, that, in hearing of outbreaks such as the above, we are without sufficient standards for prognosticating as to their relative importance. Undoubtedly however, the above-mentioned concurrence of outbreaks is exceptional; and if it expresses that plague is really for the time tending to re-development in the countries which formerly bred it, the facts may be of general interest, if only with reference to the derangements of traffic which could hardly fail to arise, were plague again to show itself in any considerable port of the Red Sea or the Mediterranean.

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* In the winter 1870–1, there had been an outbreak of plague in Persian Kurdistan, where previously none had been observed since 1835; and when the Hindieh outbreak of 1867 occurred, plague had not been observed in Mesopotamia since 1834.—J.S.

3. International Sanitary Conference.

3. With reference to the International Sanitary Conference, which at the invitation of the Austrian Government was held last summer at Vienna, I have here only to note that Her Majesty's Secretary of State for Foreign Affairs, in consultation with the Board, thought it desirable that an officer of this Department should attend the Conference; and that Dr. Seaton, first Assistant Medical Officer of the Board, was detached for this important and interesting service.

II.

II. *Administrative proceedings.*

The ordinary administrative relations of the Board with Local Authorities in matters directly concerning the Public Health may be divided into those which concern the prevention of *small-pox*, and those which concern the prevention of *other diseases.*

So far as there may be question of comparison between these sections of work, it is requisite to notice the fact (though desirable not to over-rate its significance) that, in regard of small-pox far more minutely than in regard of other diseases, the Legislature has dealt with the *machinery* of the preventive process: the prevention of small-pox having involved compulsion of so distinctive a kind, that, in respect of this, an exceptional quantity of detail comes into the statute-book. If, however, the broad intentions rather than the details be compared, there seems to be no difference of spirit between the law which (for the prevention of small-pox) requires local Authorities, by themselves or their officers, to enforce the vaccination of infants, and the law which (for the prevention of enteric fever and other filth-diseases) requires local Authorities, by themselves or their officers, to enforce the removal of nuisances; and the public is as deeply concerned in the one case as in the other to see that due effect is given to the law by the local Authorities appointed to administer it.

1. For prevention of Small-pox.

1. The prevention of *Small-pox* is an object for which the Board communicates with local Authorities systematically through the Medical Department.

The 647 Boards of Guardians of England and Wales, who, within their respective Unions or Parishes, are the local Vaccination Authorities of the Kingdom, have at work under them, first, for the performance of the vaccinations, more than 3,000 medical practitioners acting as *Public Vaccinators*, and secondly, for the non-medical parts of the business, about 1,400 so-called *Vaccination-Officers*; each Public Vaccinator, and also each Vaccination-Officer, having, under the local Authority, a special area of duty to himself. This local machinery for the prevention of small-pox is subject in certain respects to regulation and control by the Local Government Board, and is superintended and periodically inspected by the Medical Department of the Board with regard to its efficiency of work: the Board in this respect continuing the system which the Lords of the Council, when in sanitary supervision of the country, had established. The local Authorities are required to conform to certain general rules as to the qualifications of persons whom they would appoint to be Public Vaccinators, and as to the attendances which shall be prescribed to these officers: the aims being, in the first respect, that each Vaccinator shall have given proof of being competent to discharge the special duties of the office;* and, in the second respect, that such attendances shall be given as will best facilitate the performance of vaccination with due succession of well-selected lymph.† The Public Vaccinators are required to conform to certain "Instructions" embodying rules of recognised professional sanction, with regard to the precautions which give to vaccination the completest attainable safety and effectiveness.* The Vaccination-Officers—who have as their chief functions to secure obedience to the compulsory intentions of the law, and to keep such records and give such notices as are necessary for this purpose, act in all respects under regulations of the Local Government Board, and are required to make such half-yearly reports as may account, in regard of vaccination, for all children whose births have been registered in the respective areas of duty.

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* The necessity for express provision in this sense had long been shown by the experience of the London Small-Pox Hospital, as set forth by Mr. Marson and was abundantly explained in my earlier Reports to the Lords of the Council with reference to their Lordships' Regulations in this matter.—J.S.

† The necessity for special care to secure this object is explained in a departmental memorandum which I prepared for my Lords in 1859, and which is still in constant use under the Local Government Board, on the sub-division of public vaccination as affecting the supply of vaccine lymph.—J.S.

The periodical returns made by the Vaccination-Officers throughout the country form the basis on which the Board must mainly rely for its means of estimating the quantitative success of the Vaccination-Laws. The first annual collection of such returns under the Act of 1871 was completed early in 1874; and I subjoin [A] a tabular abstract of them, digested, with requisite explanations, by Dr. Seaton. It will be seen that of the 821,856 children registered as born in England and Wales in the year 1872, all up to a margin of $5\frac{1}{10}$ per cent., have been exactly accounted for by the Vaccination Officers; and I concur in Dr. Seaton's opinion that, when due regard is had to the difficulties of the case, as explained in his note on the appended table, the nearness with which the first year's returns approximate to completeness is such as the Board may deem satisfactory.†

The central Department's inspection of the proceedings of the local Vaccination-Authorities and their officers has since 1867 been so planned that, for ordinary purposes, each vaccination-jurisdiction and each separate duty-area within it, may be visited by a medical Inspector once in every two years; and this probably is the least amount of inspection with which the Board can fairly inform itself that effect is being given to the intentions of the Legislature. The Inspector ascertains the practical working of the local contracts for vaccination, inquires in detail as to the local observance of the regulations which have been made with regard to public vaccinators and vaccination-officers, and (as a final check in regard of those regulations which tend to govern the quality of vaccination) visits and examines such proportion as may be requisite of the children whose names stand on the vaccinator's register as having been "successfully" vaccinated by him. On the results of the above inspections depends the distribution of the money which Parliament votes for public vaccinators; it being characteristic of this grant, that it is not voted on the footing of mere *largesse* in aid of local rates, but has its appropriation expressly limited by the principle of payment on results. The institution of this important influence in favour of the efficiency of public vaccination dates from the Report of the Select Committee of the House of Commons in 1866 on the Vaccination-Laws; and the enactment which on the recommendation of that Committee was made part of the Vaccination Act of 1867 is as follows:—§ 5. "On reports " made to the Lords of Her Majesty's Council with regard " to the number and quality of the vaccinations performed " in the several vaccination-districts of England, or any of " them, the said Lords may from time to time, out of " moneys provided by Parliament, and under regulations to " be approved by the Lords Commissioners of Her Majesty's " Treasury, authorize to be paid to any public vaccinators, " in addition to the payments received by them from " guardians or overseers, further payments not exceeding in " any case the rate of one shilling for each child whom the " vaccinator has successfully vaccinated during the time " to which the award of the said Lords of the Council " relates."

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* Of these "Instructions" (which of course, in the light of increasing knowledge, require re-consideration from time to time) a second and amended issue took place in 1871, it having then been found that one particular class of precautions needed to be more insisted on than before.—J.S.

† Shortly after the passing of the Vaccination Act of 1871, the Local Government Board issued under that Act instructions as to the duties of the Vaccination Officers; but under the Act of 1874, these required to be somewhat modified, and a new Order was in consequence issued. The former instructions are given in the first Annual Report of the Board, Appendix A., No. 27. For convenience of reference, the Order under which the officers at present act is subjoined in my present Appendix.—J.S.

In 1874, from causes which I have above mentioned, the vaccination-inspections by the Medical Department fell unavoidably short of their usual amount; but they extended to the proceedings in 275 vaccination-jurisdictions, including the work of 1,357 public vaccinators; and particulars as to these inspections, and as to the awards of money (amounting to 8,204*l.*) which were made out of the Parliamentary grant, are given [A].

Incidentally to the superintendence of public vaccination, provision has to be made for maintaining and distributing the public supplies of Vaccine Lymph, and with regard to the arrangements under which candidates for appointment as public vaccinators obtained the authorised Certificates of Proficiency in Vaccination required of them under the regulations of the Board. In 1874 the vaccination-stations which are concerned with those special objects underwent their usual special inspection, so far as the circumstances of the year would allow; and the Medical Department during the year supplied vaccine lymph in answer to 10,478 applications. Particulars as to the sources whence this lymph was derived, and as to the applicants who received it, are given, with other statistics of this section of subject-matter [A].

In any attempt to judge how far the Board's superintendence and inspection are improving the national defences against small-pox, it is necessary to remember that, though endeavours to improve the quality of public vaccination have to some extent been in progress for the last 15 years, the inspections which were made in the first half of this period, and which proved the necessity for great reforms in the whole system, were powerless to introduce such reforms, and that a really effective mechanism for securing the good quality of public vaccination did not exist till the passing of the Vaccination Act of 1867; that similarly, though compulsory vaccination dates nominally from 22 years ago, our really effective mechanism for securing the quantitative enforcement of the law dates only from the passing of the Vaccination Act of 1871; that though, under the administration of these recent laws as superintended by the Board, the quality of public vaccination in England is now continuously becoming better and better, and the proportion of infants left unvaccinated in successive years is continuously becoming smaller and smaller, hitherto only the youngest of the population can have directly participated in those improvements,* and the benefit of the improved quality of their vaccination (in giving them a comparatively permanent security against fatal small-pox) is one which, from the nature of the case, cannot be tested in them till they are much older. The results may be very clearly foreseen which a continuance of the system must have on our national liabilities to small-pox; but at present, as regards effects already demonstrable, we can only refer to the greatly diminished proportion of small-pox among young children, as compared with that of other countries, or as compared with our own in previous times; and on this point some very striking evidence will be found in Dr. Seaton's annexed report [A] on the incidence of the terrible epidemic which began in England in the autumn of 1870 and continued till the spring of 1873.

The small-pox which the United Kingdom suffered during those 2½ years was part of a world-wide prevalence of the disease. A generalisation, which from the earliest times has been familiar to the medical profession, is, that the same diseases at different periods of time make epidemics of widely differing degrees of malignity; and as regards the present matter, it seems universally testified by skilled observers that no small-pox epidemic in living memory had been (if I may so express it) of equally malignant intention with that which is here in question. Both in tendency to spread and in severity of individual attacks, it tested to the very utmost the value of such defences as had been provided against it by vaccination; killing the unvaccinated in far more than ordinary proportion; killing also in unusual proportion persons (especially those beyond the period of puberty) whose previous vaccination had been imperfect; and even prevailing more or less against many vaccination-defences which would have borne the stress of any ordinary epidemic. The small-pox deaths in England during the 2½ years of this epidemic were 44,433 in number; and while, to persons who were agitating against the practice of vaccination, it seemed a momentary triumph to boast how "in spite of vaccination" this very sad mortality had befallen us, to others, and particularly to such as were well-informed in the history of small-pox, the reflexion occurred, that *except for vaccination* this epidemic would presumably have caused such frightful and demoralizing mortality as the worst pestilences of past centuries used to bring with them: mortality, in comparison with which even those 44,433 deaths were but few. To demonstrate how true was the latter opinion was of course not possible at the time; for it would require that accumulated statistics of the epidemic (statistics which could not be obtained till two or three years had elapsed) should be investigated with particular regard to the influence which vaccination had exerted; but in a case of this immense interest it seemed due to the general public that the investigation should when possible be made, and the teachings of so great an epidemic be set forth; and such is the purpose of Dr. Seaton's laborious and valuable report which I have the honor of bringing under your consideration. Rendering an account of the late epidemic in each of the three divisions of the United Kingdom, and in various countries and chief towns of continental Europe, and combining with such small-pox statistics as can be given in each case particulars as to the local laws and arrangements for vaccination, Dr. Seaton shows that the experience of this epidemic was in harmony with all previous experiences as to the protective power of vaccination. The belief which governs the vaccination system of this country—(that properly performed infantine vaccination, duly renewed at puberty, will virtually extinguish small-pox as a fatal disease among such populations as have recourse to it)—has long rested on so vast a basis of well-established facts as not to have needed, for scientific completeness, that any further facts should corroborate it; but, for persons not already familiar with the proofs which gave rise to our present practice, Dr. Seaton's instructive report may adequately serve instead of those proofs to justify our practice as it stands. Anyone can gather from the report the convincing illustrations which it contains, how unabatedly terrible is still the force of small-pox in the present age unless its ravages have been precluded by vaccination; and in adverting to that fact I am glad to be able to connect with it the gratifying reflexion that against this one preventable disease England is now employing with systematic efficiency, and with success which is in constant increase, those happily adequate means of resistance which the genius of an English surgeon first added to the resources of mankind.

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* It may be noted, however, that the re-vaccination of the young, as they reach puberty, is an essential part of every perfect system of vaccination; and that, as no such re-vaccination on a large scale is possible, except from the basis of a well-regulated system of infantine vaccination, so the reforms which have been made in infantine vaccination in England, tend in an indirect way to material service beyond the limits of the infant population.—J.S.

2. For prevention of other diseases.

2. With regard to the prevention of *Diseases other than Small-pox,* the Board during 1874 communicated through this Department with 56 Local Authorities.

The areas of separate sanitary jurisdiction in England and Wales are at present 1,558; that is to say, in addition to the 39 which are Metropolitan, there are 930 urban and 589 rural jurisdictions; and the jurisdictions which were visited by Medical Inspectors last year with reference (general or partial) to the administration of the Sanitary Acts, were 17 rural and 39 urban.* Of these 56 inspections I subjoin [A] a tabular list, with an abstract of the chief facts which in each case the Board's Inspector reported; and two of the reports are appended *in extenso,* as probably typical in their respective sorts of subject-matter,—one by Dr. Buchanan [A] relating to the want of hospital-accommodation in Birmingham and Aston for cases of infectious disease,† and one [A] by Dr. Ballard on the sanitary state of the Upper Sedgley Sanitary District.

The above communications neither enable me to submit to you any adequate materials for discriminating as to the progress of disease-prevention in the districts of England, nor, I apprehend, can have represented an exertion of the

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* In one of the 39 urban jurisdictions (Cambridge) the inquiry related only to one particular institution in the town.—J.S.

† The immediate occasion of this inquiry was a great prevalence of small-pox in the town; but it was mere accident that an epidemic of that disease, rather than one of scarlatina, relapsing fever, or typhus, illustrated the serious want of hospital accommodation, and I therefore class the inquiry in my present section rather than as relating specifically to small-pox prevention.—J.S.

Board's influence in favour of sanitary progress in more than a small fraction of the cases where such progress is urgently wanted.

That progress (more or less) is being made in a considerable number of the jurisdictions of England is, I think, not to be questioned. There is presumption to that effect in the constantly increasing annual amount of the loans contracted by Local Authorities for permanent improvement-purposes which in the main are sanitary, and in which works of sewerage and water-supply largely predominate. In the six accounts from 1858 to 1864 the loans thus contracted under the Sanitary Acts averaged somewhat less than 330,000*l.* per annum; in the six from 1864 to '70 they more than doubled this amount, having averaged per annum nearly 692,000*l.*; thence to the end of 1872 (29 months) the annual average exceeded 884,000*l.*; and in the last two years the respective amounts have been nearly a million, and nearly a million and a half of money.* Other general evidence points in the same direction; as, for instance, in various cases the desire of rural Authorities to acquire special (so-called urban) powers for dealing with the more populous parts of their districts;† and in many individual cases the reports of the local Officers of Health give every assurance which could be desired that good sanitary work is advancing, sometimes even rapidly advancing, in the places reported on. It is certain that in regard of the sanitary requirements of the country there has been, during the last two or three decennia, such growth of knowledge in the public mind as must have given to great numbers of persons a new sense of responsibility in the matter; and here, as in other departments of public conduct, the better knowledge as it grows, the convictions of duty as they ripen, must tend to bear practical fruit. I feel sure that, under influences such as those, very many local Authorities throughout the country are at the present time exerting themselves for sanitary purposes in a degree which, ten or twenty years ago, they would have thought quite unnecessary; and I daresay that, in an appreciable proportion of these cases, the results, either actually or in not very distant promise, are such as may be deemed fairly adequate to the circumstances.

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* The highest sum stated in any previous amount was 1,266,581*l.* borrowed in the period from Aug. 1, 1870, to Aug. 19, 1871, which immediately preceded the passing of the Local Government Board Act. In regard of the very large amount (1,457,496*l.*) borrowed in 1874, it is satisfactory to notice that in it the borrowings of rural authorities amounted to nearly 120,000*l.* All the amounts of loan which I have stated are exclusive of loans under Local Acts.—J.S.

† The cases in which urban powers as above were granted to rural authorities numbered 10 in the year 1873, and 44 in the year 1874.—J.S.

Thus far, however, we have only what is favourable in the facts. Of the larger—I fear very much larger proportion of cases, in which facts of an opposite kind would show themselves to a competent local inquirer, the Board is hitherto not systematically cognisant, except as having before it such evidence as the Quarterly Returns of the Registrar-General contain that preventable death in vast quantities goes on unprevented. These Quarterly Returns are conclusive as to the insufficiency of sanitary endeavour in a very large proportion of our local jurisdictions; and the evils which remain undealt with may to some extent be inferred from the facts which come to light (as abstracted in my Appendix) in those cases where the Board authorises medical inspection.

Among the influences which from day to day needlessly waste human life in this country, there are, as is now well known, two which immensely predominate; first, in extreme frequency, such *local conditions of filth and nuisance* as express the failure and in many cases the utter neglect, of local Authorities to fulfil definite obligations which the Sanitary Acts impose on them; secondly, almost everywhere, such *reckless disseminations of contagion* as express in part that penal checks against the wrong are hitherto of little stringency, but express also, and perhaps principally, that local Authorities fail to use with adequate skill and vigour the resources which are in their option to use against the evil. As regards these two most important sections of subject-matter, I have no hesitation in saying that, for many years to come, they will require the utmost intelligence and activity of local Authorities throughout the country to achieve what claims to be done for the due protection of human life.* And it was with reference to the innumerable local insufficiencies which I know to exist in those two great fields of disease-prevention, that I above expressed my opinion as to the proportionate unimportance of such proceedings as the Board has been taking through this Department.

Evidently it is for the Board alone to determine how far it holds itself responsible for taking cognisance of local successes and unsuccesses in regard of the prevention of disease, and for influencing or endeavouring to influence towards better sanitary administration those local Authorities in whose districts the unsuccess betrays itself. I am of course aware that this question is not one to be judged from an exclusively sanitary standpoint, but is part of the general ordering of our civil government, and that justly to decide regarding it is the function, not of medicine, but of statesmanship. In appealing, however, to the latter, I trust that I may not be speaking with an improper prejudice in favour of that great human interest for which it is the privilege of my office to be permitted to speak, if I assume on its behalf that, among the many administrative purposes for which central government in this country claims to criticise and influence and in certain cases control the action of local Authorities, none can be of more national importance than those which relate to the prevention of disease,—none, in regard of which it can be more essential that local disobedience to positive law should not be tolerated,—none, in regard of which it can be more desirable that, so far as occasion exists, and to the extent of existing knowledge and skill in the subject-matter, the detailed influence and advice of central government should be given to promote throughout the country the real intentions of the Legislature. And in behoof of these last-mentioned considerations (though with all due reserve and diffidence as regards those to which I first adverted) I have thought it essential to put before you, as matter of proportion, how slight, except in regard of small-pox, is the cognizance which the Board hitherto takes, and how far apart are its exertions of skilled influence, in regard of those local defaults of disease-prevention which annually cost many tens of thousands of lives.

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* With reference to this aim in one of its divisions, I last year submitted an endeavour which I had made to codify for general use the experience of this Department in the matter of Filth-Diseases and their Prevention; and in respect of the other division, I hope it may be possible at some future time similarly to codify our experiences as to Contagion.—J.S.

In my last Annual Report, submitting to you some remarks with regard to the relations of the Board to local Sanitary Authorities, and particularly with regard to such of those relations as attach to the Medical Department, I explained the scope and spirit of such medical inspections as I would recommend the Board to adopt as its means of sanitary superintendence. Presuming as principles, first, that local government in proportion as it fulfils its purpose must be exempt from central interference, and secondly, that central interference where admissible must rather be little than much, I submitted, as within those principles, that the Board's intervention should proceed methodically from the basis of local death-accounts: from the evidence, namely, which is afforded in such accounts as to the degrees in which preventable disease has not been prevented. And, while recognising of course that in certain of these cases the object of the Board's intervention could be attained by correspondence, I particularly dwelt on the very great advantage which, at least for many years to come, would in my opinion be gained to the sanitary progress of the country by central inspection systematically organised with reference, so far as needful, to such local defaults as a class:—"By skilled inspections under the Public Health Act, 1858, on such a "scale as practically to represent a central audit of local "death-accounts, and an exertion of central influence or "authority in favour of more active or better-directed local "efforts in places where human life had not been sufficiently "cared for, the Local Government Board would be in reality, "though only in the limited sense which the law prescribes, "a Board of Sanitary Superintendence for England." Such examination of local sanitary proceedings as is hitherto undertaken by the Board is on the basis above suggested; but with regard to the question of its present proportion to local shortcomings, I may state that the quantity of medical inspecting-force available to the Department for this branch of service is but about equal to the employment of three Inspectors; that the sanitary jurisdictions of England are, as above enumerated, 1,558; and that the mortality, other than by small-pox, to be accounted for (of course in very different proportions) by the 1,558 local Authorities, as due to causes more or less under control of law, and as principally attaching to those two great fields of disease-causation which I have specially mentioned, amounts, in the common estimate of informed persons, to at least 120,000 deaths per annum.

With regard to about 900 of the 1,558 jurisdictions, the Board is entitled to receive copies of the reports of local Officers of Health, appointed under the Order of the Board, and paid in half from funds provided by Parliament; and there are considerable parts of the country with regard to which it may be ascertained from such reports that the local Authorities are already receiving excellent advice from highly-qualified officers whom they have appointed, and that in many cases they are duly acting upon such advice. But as regards the relations of the Central Board to the facts of sanitary unsuccess which become known to it, the following three considerations have to be remembered: first, that in certain cases local Authorities, though provided with admirable Officers of Health, may be entirely disregarding their advice; secondly, that in very many of the cases in which the Board is entitled to receive copies of the reports of the local officers, those which come to hand are of little or no assistance to the Board in the sense which is here in question, but rather give reason to believe that the local officer might be very materially assisted by the visit of a medical Inspector of the Board; and thirdly, that, with regard to about 658 of the 1,558 jurisdictions, the Board (as not paying part of the local salaries) is not entitled to receive copies of the local reports.

It importantly concerns the second of these considerations to notice that, at the time when the Legislature suddenly made it an obligation on each of the local Sanitary Authorities of England to appoint one or more Officers of Health, the members of the Medical Profession who had given such study to sanitary science and administration as would fairly qualify them to be Officers of Health in any distinctive sense of the term were comparatively but very few; that therefore the new appointments had generally to be made without reference to proofs of distinctive qualification; and that in a large proportion of cases, the local Officer of Health, appointed as such with the approval of the Board, is in fact (as the Royal Commission recommended he should be) the Poor Law Medical Officer serving *quasi ex officio* in the second capacity. When regard is had to these facts, it will be evident that the advance of the new officers to a state of efficiency in which their reports may uniformly be regarded as adequate to the circumstances of the respective districts, must of necessity be a gradual process extending over years, and requiring the best assistance of suitable organization. And the fact (of which the Medical Profession has great reason to be proud) that the new offices are already in so many cases filled with credit, and in a notable number of cases with really eminent ability and success, must not obscure the fact, that, before such standards can be general in the country, very much work will have to be done, and very many difficulties surmounted.

I am, Sir,

&c., &c.

Supplementary Report of 1875*.

Sir,

In supplement to my recent Annual Report, I have now the honour of submitting to you (Appendix) the paper which I mentioned in that Report as at the time under preparation by Mr. Netten Radcliffe: setting forth the results of his laborious and instructive study of the international relations of Asiatic Cholera during the past ten years.

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* Report of the Medical Officer of the Privy Council and Local Government Board, New Series, No. V.

The international relations of Asiatic cholera.

During that space of time, Asiatic Cholera made great ravages in other quarters of the globe than Asia; and especially as regarded our own quarter, the epidemic inroads of the disease were such that twice in the decennium the several European Governments consulted together in congress as to the possibility of better defending their States against a danger which seemed of growing importance. Of the two International Conferences to which I refer, one, lasting for more than seven months, was held at Constantinople in 1866; and the other, lasting for a month, was held last year at Vienna. The former was convened at the instance of the French Government with reference to the great pestilential invasion which in 1865 had radiated from Alexandria to all parts of Europe; the latter was convened at the instance of the Austro-Hungarian Government, with reference to the state of cholera in Europe during the years 1870–4. For an account of the more elaborate proceedings of the conference of 1866 I can only refer to the two valuable volumes in which the *Procès Verbaux* (including the reports of the Committees) of that Conference were published. For a full account of the proceedings of the second Conference, it is of course also necessary to refer to the published volume of *Procès Verbaux;* but, for more convenient reference on the present occasion, Dr. Seaton, who, with Dr. Dickson of Constantinople, attended the Conference on behalf of Her Majesty's Government, has, at my request, favoured me with the annexed brief abstract of the proceedings [A].

Recent facts as to cholera in Europe have undoubtedly been of very evil omen. Europe, within the ten years' time, has twice been over-run with cholera. From the middle of 1865, when one great diffusion of the disease began, till after the middle of 1874, when a second great diffusion had apparently run its course, there possibly was no moment at which the disease was extinct in Europe, and there certainly was but little time when it could even be supposed to be extinct. It is true that, just at the end of 1868 and beginning of 1869, if traces were still remaining of the great diffusion which began in 1865, they were no longer publicly identified as such; but then, in the summer of 1869, began the second great diffusion, which was destined to have a five years' course. Whether or not there was latent continuity of process between those two great diffusions of cholera—whether the second of them began (as the phrase goes) in "re-crudescence" of the first, or arose independently of it in a second invasive influence from Asia, has been matter of doubt among epidemiologists, and must perhaps remain undecided. Be that, however, as it may, the broad fact, concerning the nations of Europe, was that during the decennium 1865–74 Asiatic Cholera hardly ever ceased to more or less afflict or alarm them; and this fact, which, when duly understood, could not but suggest grave considerations as to the future, is receiving at the present moment a confirmation of its serious import in the circumstance that already, though only in the middle of 1875, cholera is reported to be again diffusing itself on the Syrian side of the Mediterranean.

Mr. Radcliffe's annexed paper is essentially narrative: telling facts which need no argument to emphasise their meaning; and, in submitting it to you, I would only beg leave to preface it with such few remarks as may help to define its practical bearings.

The special aim of the paper is to exhibit, with as precise detail as possible in regard of times and places, the various relations of cholera for the past ten years in this Western division of the Eastern Hemisphere: to show, as far as can be learnt, what local epidemics composed the total of each great diffusion; and in what order of time, and in what (if any) mutual connexion, they occurred; and in what (if any) way the local events were related to the circumstances of inter-local traffic. As regards the critical events of 1865, my annual report made to the Lords of the Council in 1866 had appended to it an excellent account then furnished by Mr. Radcliffe of such facts as were yet known; and the facts were likewise to some extent recorded by the Constantinople Conference of 1866; but, even as regards the events of 1865 Mr. Radcliffe is now able to add very materially to the knowledge which was possessed in 1866; and as regards all events subsequent to 1865, the evidence is now put together for the first time in Mr. Radcliffe's annexed paper.

The labour and difficulty of compiling such a record as Mr. Radcliffe has made are infinitely greater than persons who have never tried the same sort of work can well imagine. His raw material (consisting of all information received by different Departments of Her Majesty's Government with regard to the movements of cholera in foreign parts) has been of really immense quantity, but, though of such extent, has been often at first far too vague for scientific use, and has often failed to give essential facts; so that, before exact history could in any way be founded on the first material, much collateral inquiry has had to be undertaken; and occasionally long periods of time, even in some cases years, have elapsed before Mr. Radcliffe could succeed in getting certain links of evidence which were necessary to complete his record. Partly for this reason, and therefore unavoidably, Mr. Radcliffe's account of the second of the two great diffusions of cholera is far less elaborate than of the first; but, as a further reason for this difference, I may add that, when the one diffusion had been so exhaustively studied—studied with a completeness perhaps never before attempted in regard of so large a passage of epidemiology, an equally detailed study of the other diffusion might, comparatively speaking, be dispensed with.

The practical results of Mr. Radcliffe's research are to be looked for in two directions: first, in the facts which are brought to light with regard to the influence of human intercourse in determining the diffusion of cholera; and secondly, in the inferences which arise with regard to the virtual illimitability of that influence (as between Asia and Europe) by measures of the nature of quarantine.

As regards the first matter, the evidence which Mr. Radcliffe exhibits is uniformly to one effect. So far as the extension of the disease could be followed in detail, it was found to have had definite relation to personal traffic: in various important cases the arrival of persons affected with the disease was unquestionably the starting point of local and perhaps national epidemics; and no extension of the disease was to be found, where the arrival of human beings from previously infected places was not either proven or probable.

It is important to appreciate those results in their negative as well as in their positive bearing. Detailed observation of particular outbreaks of cholera, and suggestions of analogy and experiment, have long led European pathologists to believe that the disease possesses great, though peculiar, power of spreading from the sick to the healthy; and Mr. Radcliffe, so far as he shews that particular cholera-epidemics have been started by imported cases of the disease, furnishes only additional illustration of that now (as I believe) unquestionable doctrine. But Mr. Radcliffe's other and merely negative result is in my opinion not less important: the result, namely, that in his very wide epidemiological study, extending from our own shores to the torrid climates of Africa and South-western Asia, he finds no reason to impute to cholera (outside the limits of India) any other mode of origination and extension than such as that doctrine expresses.

If, then, human contagion is the one active power in the international spread of cholera, is it possible so to restrict the intercourse between infected and non-infected countries as to prevent the spread of the contagion? Mr. Radcliffe's results, so far as I have quoted them, are eminently of a sort to suggest that question; but the impossibility of its being affirmatively answered was perhaps never so well illustrated as it is in parts of his paper.

In my above-quoted 8th Annual Report to the Lords of the Council, I entered at some length on the question, whether quarantine established at the ports of this country could be available to protect us against cholera: and I expressed a confident opinion that it could not. I submitted that quarantine, of a sort to be trusted in as a national defence, is not conceivable except in proportion as a people lives apart from the great highways of commerce, or is ready and able to treat its commerce as a subordinate political interest: that though undoubtedly quarantine, planned with the precision of a scientific experiment, and conducted with extreme rigour, may keep cholera out of places (such as remote and secluded islands) where the extremely difficult conditions can be completely fulfilled, yet, under other circumstances, quarantine cannot reasonably be expected so to succeed, and must then be regarded as a mere irrational derangement of commerce. I presumed of course that our local authorities would individually have at command against the chances of cholera-importation the same powers of interference as against any dangerous infections of our own country, and that port-authorities might learn to exercise those powers in regard of evident arrivals of cholera in a way to confer at least some local service; but it seemed to me that, in the case of the United Kingdom, more than this could not be hoped for.*

That argument, primarily meant to apply to this country, might be expected to apply to other countries in proportion as they are commercial, or in proportion as great movements of population are kept up by other causes, as for instance in religious pilgrimages; and there are plenty of facts in Mr. Radcliffe's paper, to show how utterly futile against cholera were the quarantine-establishments of Europe in 1865. Egypt, aware early in May that illness of some sort was epidemic among the multitude of pilgrims then at Mecca, had provided that no returning pilgrims should disembark at Suez till their ships had undergone medical examination, and been found free from infectious disease; but during the latter half of May, ship after ship, bearing thousands of pilgrims, arrived at Suez without betraying any such evidence of disease as the authorities were prepared to consider a reason for quarantine; and Alexandria (as well as other parts of Egypt) received abundant choleraic infection from these arrivals, before any single case of cholera had been identified by the health-sentinels at Suez. Next, before Alexandria confessed itself to be infected, it had infected Marseilles; and through Marseilles it infected the rest of France. Then, before Marseilles confessed itself infected, Valencia had received a most disastrous infection from or through it; and from Valencia all Spain was infected. Odessa, before it was recognized as itself having cases of cholera, had let infection pass through it, first to start in

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* For detailed discussion of Quarantine, *see* the section on that subject re-printed from 8th Annual Report to Privy Council.—J.S.

Podolia an epidemic which diffused widely in South Russia, and secondly to start at Altenburg in the middle of Germany an epidemic which diffused widely in Central Europe. Italy received its infection through the quarantine-establishment of Ancona; which both infected the town of Ancona by sending infected things to be washed there, and also allowed an undiscovered case of cholera to pass on from its lazaret, after six days' detention, to infect the town of Pistoia.

The above cases, which were before the Constantinople Conference, could give little encouragement to a belief that, when cholera is once current in Europe, the individual States can protect themselves against it by respectively quarantining each other; and accordingly the Constantinople Conference, though it approved the continuance of such quarantines, insisted far more on the very important advantages which would be gained to Europe at large if the States, acting collectively, would establish at the mouth of the Red Sea a joint quarantine against Asia. At the Vienna Conference, where, as Dr. Seaton's annexed abstract sets forth, the resolutions of the Constantinople Conference were more or less re-considered, that recommendation for a joint quarantine at Babelmandeb was not expressly renewed, and was not, Dr. Seaton says, meant for renewal, but it was not expressly renounced; and as the Conference clearly adhered in principle to the recommendation of strict cholera-quarantine against Asia, I would observe that Mr. Radcliffe contributes material of particular interest with reference to the proposal of 1866. The proposal started from a belief that the infection of 1865 had come into the Red Sea as a direct importation from the far East; but Mr. Radcliffe gives facts which I think are conclusive against the correctness of any such opinion. He shows that before the arrival at Jeddah of the particular ships which the Conference believed to have infected the Hedjaz, and thus to have started the great outbreak of 1865, cholera had for some time been extensively prevailing both in the Yemen and Hadramaut provinces of southern Arabia and also in the Somali country on the African side of the Gulf of Aden; that the ships in question, instead of having brought cholera from farther east, had probably contracted it at Makallah; but that at any rate quarantine at the mouth of the Red Sea would, if it had existed, have dealt only with one of the dangers of infection to which the Hedjaz was at the time exposed; and further that, apart from the infection of the Hedjaz, cholera, early in 1865, was steadily making its way from Beloochistan up the Persian Gulf and Euphrates valley, to invade Europe otherwise than through Egypt.

I have noted that the facts which Mr. Radcliffe tells with regard to the spread of cholera in Europe in 1865 say little for the value of such cholera-quarantines as any one European State can maintain against any other; and the practice of this country in respect of cholera in Europe has long recognised that little or no control can be exercised at ports of arrival except as to persons who on medical inspection are found manifestly infected with the disease. Control to this limited extent, not pretending to efficiency as a measure of national defence, but able to be of some local value where local authorities are vigilant in exercising it, and in principle scarcely exceeding that which is exercised in respect of small-pox or fever, is what this kingdom has in place of quarantine: and it is satisfactory to read in Dr. Seaton's abstract of the proceedings of 1874 at Vienna, as compared with those of 1866 at Constantinople, how strongly the balance of European opinion is now inclining to the side of our English practice.

As regards the interest which the world at large has in the preventability of Asiatic Cholera, Mr. Radcliffe's present paper does not pretend to deal with more than one section of a very great subject-matter; but he has so treated this section as to give additional importance to the sections which lie logically next to it; and the reader who would appreciate it in that connexion, should briefly pass them in review.

Cholera, as a geographical subject-matter, divides itself for our practical purposes into three sections: (1) cholera, as existing in India; (2) cholera, as diffusing to other countries; and (3) cholera, as we here, in England or generally in Europe, see it from time to time epidemic among us.

Persons regarding exclusively the second of those sections, and seeing it as now displayed by Mr. Radcliffe, might at first take an almost fatalistic view of the immense mischief which cholera inflicts on mankind. For they see the disease diffusing itself as an attribute of such vast social movements as it is evidently impossible to control or minutely scrutinize: spreading itself, namely, in all directions in those constantly-moving streams of religious pilgrimage and commercial enterprise which constitute very large proportions of national life, and they see that a first, but unattainable, condition of dealing completely with a contagion thus distributed would be that they should be able to immobilize at their discretion the great tides of human life which convey it. They would no doubt see that the marine exportation of cholera from India may be considerably impeded by an enlightened and vigorous supervision of shipping, such as Her Majesty's Indian Government have designed under the Acts (constantly in course of amendment) which relate to native passenger-ships; but they would fear that, even if only in such movements of land-population as comparatively escape control, means must continue by which cholera existing in India will have ample facilities for extending to Europe; and they would recognise how the progress of circumstances is constantly making it less and less possible that, at times when cholera is present in any territory of Europe, the other territories should succeed in really protecting themselves against it by restrictions on international movement.

Undoubtedly, therefore, it is in directions which are outside the view of Mr. Radcliffe's present paper, that we must mainly look for such hopes as can be entertained of dealing effectively with this great pestilence. We have to hope, on the one hand, that India may be made less productive of the infection: we have to hope, on the other, that other countries may be made less susceptible of it. And in each of these directions, there is room for very hopeful work.

Of the conditions which in Europe make local susceptibility to the infection of cholera, I have often had occasion to speak. That cholera, when imported into a locality, will under certain circumstances spread from the sick as from a centre, is among the certainties of medicine; but we know with at least equal certainty that its means of thus spreading are strictly limited, and the limiting conditions which are best known to us in regard of it are those which bring it into intimate analogy with our own enteric fever, and justify us in classing it as a Filth-Disease. On the preventability of cholera in this point of view, I have said so much on other occasions that I need not now insist on it, and would only refer to the general report which I had the honour of laying before you a year ago, on the subject of Filth-Diseases and their Prevention.* It cannot I think reasonably be doubted but that, as conditions of filth, and especially as filthy conditions of water-supply, are the main facilitating conditions for the dissemination of cholera in Europe, so they must be immensely potent influences in favouring the advance of cholera from station to station in successive epidemic outbreaks in the countries which lie between India and Europe; and it would seem certain that, along the whole succession of lands which transmit the streams of westward traffic from India, common hygienic vigilance in respect of those conditions may be of very great effect in impeding the diffusion of cholera.

Regarding cholera in India, apparently two sets of conditions have to be distinguished: (a) the conditions of the disease's endemic prevalence, in larger or smaller quantity, in a limited portion of the Indian continent, and (b) the conditions of its occasional spread over areas indefinitely larger.

That under the latter head must be counted, at least in part, the same property of contagiousness, and the same relation of this property to circumstances of filth, as we know to be the essential conditions for the extension of the disease in Europe, is an opinion which European pathologists find it impossible not to entertain:† and so far as that European opinion holds good, the amount of cholera-diffusion in India is likely to be controlled by the same preventive measures as are certainly effectual for the like purpose in Europe. Those parts of the world therefore, which have had the habit of receiving cholera-infection from India, and especially those which have received it from secondary centres of infection, may expect to incur less and less of this danger in proportion as common sanitary government shall more and more bring within control the common Filth-Diseases of that vast country. And in this point of view it is most hopeful to know that for many past years, and even more rapidly than Europe has been able to appreciate her own interest in the sanitary progress of India, the British Government has been organising in that part of the empire such provisions for sanitary government as promise soon to compare not unfavourably with the present institutions of Europe itself.

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* Report, New Series, No. II.

† If this opinion is less generally entertained in India, or in parts of India, than it is in Europe, probably the difference of opinion is in great part only an expression of the fact that it must be more and more difficult to prove the contagiousness of the disease in proportion as studies on this point are made in places where the disease may be autochthonic.—J.S.

The distinctive Indian problem, however, is that of the endemicity of cholera in part of the Indian area. It is from within British territory that this enemy of the human race sallies forth from time to time to do world-wide execution; and the first threat of each coming foray is that the disease is produced in greater quantity in the area to which it primarily belongs. There, in lower Bengal—specially in the Sunderbunds and other alluvial lands from Juggernauth to beyond the mouth of the Bhurmpooter, cholera is said to be as normal to the district as ague to the marsh-lands of Europe, and as definitely related to the seasons as if it were a fruit of the earth. To learn the conditions of that endemicity and its variations is a problem of the highest science; and to control them in the interests of mankind will be among the noblest administrative tasks which the responsibilities of empire have ever imposed. It would be foreign to my province to dwell upon this part of the subject: but I may permit myself to advert to the fact that Her Majesty's Government, now for some years past, has been promoting the study of cholera in India with the best lights of contemporary European knowledge: and no one will doubt but that here, as in other departments of medical research, truly scientific study must eventuate in practical good.

Briefly then,—if the constantly-developing and constantly-accelerating commerce between India and the rest of the world is not to carry with it a constantly-increasing terror of pestilence, the safeguards, I apprehend, will consist, not in contrivances of the nature of quarantine to maintain from time to time more or less seclusion of nation from nation, but rather in such progressive sanitary improvements on both sides as will reduce to a minimum on the one side the conditions which originate the infection, and on the other side the conditions which extend it. That cholera, as endemic and epidemic in India, will, even in the near future, be rendered by the exertions of the British Government far less terrible to Europe than it has been for the last half-century, is a conclusion which I think cannot fail to be entertained by those European epidemiologists who are conversant with the annual volumes, printed by order of the Secretary of State for India in Council, with regard to the measures adopted for sanitary improvements in India.

I am, Sir,
&c., &c.

Annual Report of 1876*.

SIR,

I HAVE the honour of submitting to you my Report of the proceedings which in the year 1875 you directed to be taken through the Medical Department of the Local Government Board in matters concerning the Public Health.

I. A large part of the proceedings consisted as previously, and as was explained at some length in my last year's Report, in the inspection of Public Vaccination, with other superintendence of the action of the local authorities and officers who are charged with duties under the Vaccination Acts.

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* Reports of the Medical Officer of the Privy Council and the Local Government Board, New Series, No. VII.

Public vaccination.

1. Under the system which the Lords of the Council established, and which has been continued under the Local Government Board, each ordinary vaccination-district of England is visited by one of the Inspectors of this Department once in every two years*; but in the year 1874 (as I had to mention in my last year's Report) it had happened that this customary inspection was, from accidental causes, considerably interrupted; and as it was necessary in 1875 to deal with the arrears which had thus arisen, the quantity of vaccination-inspections done during 1875 was to that extent in excess of an average yearly amount. The inspections of the former year had extended only to 1,357 vaccination-districts, comprised in 275 unions and non-united parishes; but those of 1875 extended to 1,782 vaccination-districts comprised in 371 unions and parishes. I enumerate the unions and parishes which were inspected as above, and give particulars as to the awards of money which were made in each case to the public vaccinators, under § 5 of the Vaccination Act of 1867, out of the grant provided by Parliament for this purpose [A]. The awards actually made amounted to 15,676*l.*; but a portion of this amount, probably about 2,500*l.*, represented the accidental excess of the vaccination-inspections of 1875 beyond the average yearly number.

2. The success of our modern vaccination-laws in enforcing the general vaccination of infants is to be measured by the periodical returns which are made to the Board, under the Act of 1871, by the so-called vaccination-officers throughout the country. Of such returns the first collection, which related to children born in the year 1872, was completed early in 1874, and a digest of it, prepared by Dr. Seaton, was included in my last Annual Report: a second such collection, relating to children born in 1873, was completed early in 1875, and Dr. Seaton's digest of it is now given [A]. It will there be seen that of the 826,508 children registered as born in England and Wales in the year 1873, all, up to a margin of less than 5 per cent. had, at the time of closing the return, been accounted for by the vaccination-officers; that, of

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* A few districts are, for special reasons, visited every year.—J.S.

the $95\frac{2}{3}$ per cent. accounted for, $85\frac{1}{5}$ were accounted for as vaccinated, and $9\frac{3}{4}$ as having died early and unvaccinated; while the small residue, not quite $\frac{2}{3}$ per cent. on the whole number of births, included infants who had contracted small-pox before they could be vaccinated, infants who had been certified as insusceptible of vaccination, and (as by far the largest item) infants whose vaccination had for the time been postponed under medical certificate.

3. The maintenance of the public supply of vaccine lymph, and the arrangements under which candidates for appointment as public vaccinators obtain the authorised certificates of proficiency in vaccination required of them by the regulations of the Board, were in 1875 as usual superintended by the Board through this Department; and the vaccination-stations which are concerned with those special objects underwent their usual special inspection. Subjoined [A], I give the statistics of these branches of service; and here I need only mention that in 1875 the Department supplied vaccine lymph in answer to more than 10,000 applications.

Inquiries into Local Sanitary Administration and respecting outbreaks of Disease.

II. In 1875, 27 local inquiries were made by inspectors of this Department with regard to particular facts of disease in particular places, or to conditions which were deemed likely to cause disease; and I subjoin [A] a list of these inquiries, with an abstract of the chief results of each as reported by the medical inspector. In 4 of the 27 cases the matter of inquiry lay chiefly or wholly outside the province of the local sanitary authority; but in the other 23 cases, the inspectors' reports, so far as they go, exhibit the working of the Sanitary Acts under the 41 local authorities (25 urban and 16 rural) whose districts were visited. In England and Wales, however, the areas of separate jurisdiction for general sanitary purposes are 1,557; that is to say, in addition to the 39 which are metropolitan, there are 928 urban and 590 rural jurisdictions: and the above inspections, extending to only 41 of this number, though they represent, as applied to the new Local Sanitary Administration, the inquiring function which was formerly exercised by the Privy Council under the Act of 1858 in matters concerning the Public Health, evidently do not constitute an amount of observation on which it would be possible for me to base any such general report under that Act with regard to the sanitary progress and requirements of the country as I can present with regard to vaccination.

Concerning two of the cases in which local inquiry was made, the reports, which in both cases are by Dr. Buchanan, are subjoined in full. The one relates to a considerable and very disappointing prevalence of enteric fever in the town of Croydon, where for many years great exertions have been made for sanitary improvement, and in regard of which it is therefore particularly important that the explanation of so unexpected a result should, if possible, be arrived at. The other relates to a curious outbreak of scarlatina among certain persons—a private family and its guests, who had met on a festive occasion, and who, it seemed probable, might have got their infection in common from partaking of an infected article of food.

Places were also visited by medical inspectors on six occasions with reference to questions of hospital-accomodation for cases of infectious disease: chiefly in order to assist the Board in determining whether (under a provision of law which has since been repealed) it should declare particular hospitals to be for the purposes of the law within a "convenient distance" of particular sanitary districts, or whether its approval, required in other respects for the particular hospital-arrangements, should be given. On one of these occasions the question concerned the five small neighbouring urban districts of Drighlington, Birstal, Birkenshaw, Churwell, and Atherton; on another, the two neighbouring rural districts of Chester and Tarvin; on the others, singly, the respective rural districts of Darlington and Hexham, and the respective urban districts of Todmorden and Over.

III. In addition to the above proceedings, two general inquiries, of the sort by which the Board from time to time seeks to increase its own knowledge and efficiency with regard to particular sections of the large sphere of medical subject-matter in which it has to advise or direct, were, in 1875, begun in the Medical Department:—one, a more exact and systematic study of the conditions which determine the spread and intensity of scarlatina; the other, a study concerning the effluvium-nuisances which arise in connexion with various manufacturing and other branches of industry, and specially with regard to the effect upon health of each such industry, and to the degree in which the nuisance can be prevented.

Inquiries respecting the causes of scarlet fever;

1. The inquiry concerning scarlatina is in the hands of Dr. Buchanan, who, by way of introduction to it, has had to make careful examination of the mortuary statistics of the disease as presented in the Registrar-General's returns of the last 22 years. This examination has not hitherto suggested any clue which could advantageously be followed up by detailed local inquiries; and it seems probable that the progress of the investigation must mainly depend on opportunities which the Department may accidentally find, or which the friendly co-operation of local officers of health and of private medical practitioners may afford us, for studying in detail, and at the earliest possible moment, such outbreaks of scarlatina as shall appear exceptional in any of their circumstances, and particularly those where the outbreak may seem imputable to any other cause than contagion.

and respecting effluvium nuisances.

2. The inquiry concerning the branches of industry which tend to produce nuisance by their effluvia is in the hands of Dr. Ballard, who possesses very eminent qualifications for dealing with it successfully. Inspections in contribution to it have already been made by him on a large scale in and about the Metropolis and down the Thames, as also at several centres of industry in the Midland Black Country and in Lancashire, and at Plymouth and Devonport, Bristol, Southampton, and some other places: and the offensive industries, large and small, which he has investigated, are already not fewer than fifty. Extension of the inquiry is still necessary, especially in order that the practical conclusions arrived at, with regard to the degree in which any given effluvium-nuisance is preventable, may rest on a sufficiently large basis

of facts; and I therefore, instead of now bringing before you any fragmentary statement from Dr. Ballard, propose that his whole treatment of the subject should come before you later in a supplement to the present Report.

Foreign epidemics.

IV. In respect of the cognizance which the Medical Department has to take of the progress of Foreign Epidemics I subjoin [A] a Memorandum by Mr. Netten Radcliffe on the modern history and more recent movements of Levantine Plague. I regret to observe that at the present time the infection of the disease is in Baghdad; for, being there, it may find considerable facilities for diffusing itself to other places; and though, in view of the experience of the last two centuries, we need not, I think, anticipate as probable, that, if plague should extend considerably in the Levant, it must therefore necessarily extend to any part of Western Europe, still, any wide Eastern diffusion of the disease, especially if to the seaports of Turkey or Egypt, could hardly fail to excite alarm in Western Europe. and at least to cause much derangement of traffic.

In my last Annual Report I mentioned that Mr. Radcliffe was at the time engaged in compiling an account of the movements of Asiatic Cholera, in relation to Europe for the last preceding ten years; and subsequently, in supplement to the Annual Report, I had the honour of submitting to you the elaborate compilation which Mr. Radcliffe with some months further work had then completed. Since the date of that supplementary report of last year, nothing in respect of cholera has occurred which seems to require present mention.

I am, Sir,
&c., &c.

PRIVY COUNCIL REPORTS, 1874–1877.

Scientific Investigations in 1871–3.*

TO THE LORDS OF HER MAJESTY'S MOST HONOURABLE
PRIVY COUNCIL.

MY LORDS,

IN continuation of former reports, referring to Scientific Investigations made under your Lordships in this Department, I have now the honor of laying before your Lordships the subjoined five papers [A], and would beg leave to prefix to them a few introductory words, first, with regard to the branch of work to which the papers belong, and then with regard to the papers respectively.

Scientific Investigations.

The purpose of the Scientific Investigations which are made in this Department is to contribute in a particular way to the progress of the Art of Medicine.

The sorts of study by which the Medical Profession hopes to extend its means of usefulness to mankind, whether as regards the cure of individual cases of disease, or as regards those large acts of preventive medicine which are of interest to masses of population, may broadly be distinguished as two. On the one hand, there are studies which every member of the Medical Profession (more or less according to his circumstances) has both opportunity and inducement to cultivate at least for his own use, and generally for that of others, by intelligent observation and record of the facts which come before him in his daily practical work, and by scientific generalisations from such experience; and I need hardly observe that, from studies of that sort, which are a life-long

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* Reports of the Medical Officer of the Privy Council and the Local Government Board, New Series, No. III.

Scientific Investigations.

happiness to innumerable medical practitioners, the aggregate efficiency of the Profession is always in course of increase. On the other hand there are extremely important studies, for which the ordinary professional practice supplies neither opportunity nor immediate stimulus; studies, namely, of elaborate and purely scientific research in aid of the development of medical knowledge; studies never immediately convertible to pecuniary profit, but perhaps, on the contrary, involving heavy cost; studies, too, which from their nature cannot promise rapid results, nor be conducted in fragments of leisure, but require systematic and continuous labor extending over long periods of time.

It cannot be expected that studies of this latter sort, even where of the highest eventual importance, should generally be cultivated to any adequate extent by private medical investigators; and the distinctive intention of the Scientific Investigations which are conducted under your Lordships' auspices has been to supplement in that direction the ordinary resources of private medical observation. It is of the essence of the case that the work does not pretend to immediate popular application, but addresses itself primarily to the deeper scientific requirements of the Medical Profession, and is therefore in an extreme degree technical. It is also of the essence of the case that, in common with everything which is tentative the work may sometimes have its turn of temporary unsuccess and disappointment; and that therefore its results (as indeed the results of every scrupulous scientific investigation) are less suited to be measured from year to year than in terms of several years taken together.

The work which is at present in progress is an exceedingly large and various study, having many divisions and subdivisions of its own, and sometimes (as will be seen) involving collateral inquiry, but nevertheless, in its intention, quite definite and single. It aims to be a systematic study of the intimate pathology of the *Morbid Infections*, acute and chronic.

Such study in regard of any one infection has of course several lines of investigation: for, on the one hand, the infective agent has to be identified; and, on the other hand, the successive changes which it effects in the living body have

Scientific Investigations.

from beginning to end, to be made intelligible. Then, scientifically speaking, no morbid change in the body can be stated in intelligible terms except with exact comparative reference to health as a standard; and in the present case the things and processes as to which the questions of comparison arise, and which belong to the subtlest subject-matters of physiological research, are hitherto, in a large part of the field, but very imperfectly known as to their normal standards: so that, to this large extent, an indispensable preliminary to progress in the pathological study is at least to verify and complete the required physiological standards of comprocedure and in not a few cases to invent new methods by which observations so subtle may be conducted.

Without pretending to prejudge exactly what may be the eventual application of each addition made to scientific knowledge, I may observe in general terms that some physiological and pathological work seems rather to connect itself with the hopes of Preventive, other rather with the hopes of Curative, Medicine. Every process of disease admits of being contemplated and investigated from either of two opposite points of view: either, namely, from the side of the morbific cause, and with particular reference to the initiatory acts of disease; or from the side of the final morbid effect, and with particular reference to the modes of operation by which disease tends to destroy life. Researches in the former sense may peculiarly be expected to increase our powers of preventing disease, and researches in the latter sense to suggest improvements in therapeutical practice.

It is chiefly from the former of those points of view that Professor Sanderson has for some years been working under your Lordships in one large part of the Scientific Investigations; in which division of the field he has of late been very ably seconded by Assistant-Professor Dr. Klein, and on the present occasion also presents a contribution of much interest by Dr. Creighton.

Ætiology of acute infective diseases.

Of the annexed papers the first two, respectively by Dr. Sanderson and Dr. Klein, relate to the intimate ætiology of the acute infective diseases. Ten years ago we had not even a beginning of any true insight into the respective *Contagia* which excite those diseases; and considering the large and lasting interest which exact studies in this field of scientific research must have for the human race, I think the fact noteworthy that the first of such studies were instituted, and the first steps of discovery made, with reference to a contagious fever of horned cattle. I refer, namely, to the researches which were made under Her Majesty's Government in 1865 in aid of the then Cattle Plague Commission: when Dr. Beale, working at the microscopy of the disease, drew attention to the swarms of extremely minute particles which he found universally present in the textures and juices of the animals, and which he believed to be the contagium of the disease; and when Dr. Sanderson, working at the matter from a different point of view, succeeded in showing experimentally that the true contagium admits of being physically distinguished in the animal juices which contain it, and of being so separated from them as to leave them without infective power. In the next succeeding years, the writings (to which I have on former occasions adverted) of Dr. Hallier, Professor of Botany in Jena, brought under animated discussion, as a branch of micro-phytology, the nature and mode of origin of contagium-particles in a great variety of diseases, human and brute: new experimental knowledge of several contagia was set forth in the writings (to which also I have before referred) of Professor Chauveau, of the Veterinary School of Lyons; and in 1870 I had the honor of presenting Dr. Sanderson's first report of researches made in the matter under your Lordships' direction. At that time, general conclusions already seemed justified; first, that the characteristic shaped elements, which the microscope had shown abounding in various infective products, are self-multiplying organic forms, not congeneric with the animal body in which they are found, but apparently of the lowest vegetable kind; and, secondly, that such living organisms are probably the essence, or an inseparable part of the essence, of all the contagia of disease. The study of morbid contagion was thus brought into seeming affinity with that which had for some years before been made by Professor Schröder and M. Pasteur in the ordinary processes of fermentation and putrefaction; and there began to become faintly visible to us a vast destructive laboratory of Nature, wherein the diseases which are most fatal to animal life, and the changes to which dead organic matter is passively liable, appear bound together by what must at least be called a very close analogy of causation. This view of the matter has since then become greatly more distinct in consequence of investigations made under your Lordships by Dr. Sanderson, particularly in 1871 and 1872, with reference to the common septic contagium or ferment;[*] for in that ferment, particulate as above described, there seems now to be identified a force which, acting disintegratively upon organic matter alike whether dead or living, can on the one hand initiate putrefaction of what is dead, and on the other hand initiate febrile and inflammatory processes in what is living.

Continuation of this line of study in regard of acute infections of the living body is represented in the first two of the appended papers.

Microphytes of contagion.

In the first paper Dr. Sanderson brings down to the present time an account of the *Microphytes of Contagion;* setting forth more particularly such positive knowledge as has yet been obtained with regard to the respective contagia and respective morbid processes of diphtheria, erysipelas, relapsing fever, and (though but rarely a human disease) the splenic fever or "milz-brand" of veterinary practice.

Variola Ovina or sheep pox.

The second paper represents a contribution to the growing modern doctrine of contagion, in an exposition by Dr. Klein of the intimate nature of the local changes which characterise the acute zymotic disease known as *Variola Ovina* or *Sheep-Pox.* Dr. Klein has been able to identify the contagium-particles of that infectious fever as definite microphytes growing and fructifying with vast rapidity in the canals and tissues of the infected skin: the woodcuts of his annexed paper show the process to have been observed by him with a completeness not yet, I believe, attained in regard of any other such case: and these results of his, while they complete as regards the special disease in question the broad pathological outline which previous inductions had rendered probable, must also, I think, be regarded as tending very importantly to confirm, while they illustrate, the general doctrine of the vitality of contagia.

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[*] For convenience, in speaking of this morbific influence, I use the singular number, but have no intention of implying that ordinary putrefactive changes have only one ferment which can be considered habitual to them.—J.S.

Tubercular diseases.

The third of the annexed papers, also by Dr. Klein, and founded on work of his which has been in progress for more than two years, continues a line of research already much worked by Dr. Sanderson, with regard to the most important of all chronic infective processes: that, namely, which is at the root of the so-called *Tubercular Diseases* of the animal body, and which has its highest practical interest in relation to the pulmonary phthisis of the human subject. In my Report of 1868, I had to mention to your Lordships an infinitely interesting light of new knowledge with regard to tubercular disease, in the discovery which M. Villemin had recently made, and which other observers had immediately confirmed, of its being inoculable from subject to subject. During the years which have since passed, further and very striking illustration of the communicability of tubercle has been given by the results of experimental feeding with the milk of living tubercular animals, or with bits of diseased texture from such animals when dead; it having been found that in the subjects of such experiments the contagium penetrates by the absorbent organs of the alimentary canal, and so diffuses from them its influence to other organs of the body as to produce general tubercular disease.* With my Reports of 1868 and 1869 I submitted to your Lordships important papers by Dr. Sanderson on the studies which had then been made of tubercle in its infective relations; and the paper by Dr. Klein which I now submit gives a second series of results in the same subject-matter. It has from the first been a necessary part of the researches into the processes of tubercular infection in the animal body, that very exact study should be made of the intimate anatomical conditions which determine the sequence of its phenomena and make different organs differently susceptible of it. In the earlier researches Dr. Sanderson found himself obliged for this reason to make much anatomical study of the lymphatic glands; and in the later researches it was an indispensable first need that the knowledge of the lymphatic system should be completed by an exhaustive investigation of the radicles and gland-rudiments of that system in at least the serous membranes and the lungs. Dr. Klein's fulfilment of that large preliminary task has added very valuably to previous knowledge of the normal anatomy; but in the accompanying paper, which essentially relates to the course of tubercular infection in the organs referred to, these results of his two years' work are only given with such amount of detail as may make the morbid anatomy quite intelligible.*

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* In this connexion it deserves notice that within the last few weeks Dr. Hermann Weber has brought before the Clinical Society some facts of a strikingly suggestive kind as to the possibility of tubercular infection being freely communicated to women through their conjugal relations with men who have pulmonary phthisis in a quiescent or very chronic state.—J.S.

The broad results of modern discovery in regard of ordinary tubercular disease tend to represent it as a chronic locally-originated zymotic process, which, starting under certain conditions in one first spot of the (predisposed) animal body, advances by successive steps in definite anatomical lines to infect the entire system: a process, which by means of its characteristic products is inoculable from part to part, and from subject to subject; but of which in certain other cases the locally originating cause or contagium appears to be the common septic ferment, or a ferment not yet separable from the septic.† This being the tendency of recent knowledge in regard of tubercle, evidently there must arise from it very important suggestions (on which I need not here dwell) both as to further like studies of the same disease, and as to tentative applications of the knowledge in the province of preventive medicine; and suggestion also arises with regard to a collateral interest scarcely less important than that of tubercle.

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* I may note that these studies of Dr. Klein's, and also that relating to Sheep-Pox, were completed at a time when my former series of reports had come to an end and the plan of the present series was not yet settled; and that, as it was desirable not to delay scientific publication of the results, the papers were, with their Lordships' sanction, communicated at once to the Royal Society.—J.S.

† That the acute tuberculisation of organs is preceded by an infection of the blood is made in the highest degree probable by a consideration of the circumstances of cases: but, as to the source from which this infection would first have come, evidence enough for judgment is not yet given.—J.S.

Cancer.

In view, namely, of these results of the modern investigation of tubercle, question naturally arises whether analogous investigation of *Cancer* might not be equally successful. The analogy between the two sorts of disease must of course not be overstrained, nor be construed into any prejudgment of facts; but subject to this condition it will, I think, be generally admitted that cancer and tubercle are morbid processes so nearly parallel as probably to throw light on one another, and that methods of investigation which have led to an immensely improved knowledge of the one disease can hardly not lead to instructive results concerning the other. Careful consideration has therefore been given to the possibility of investigating more exactly than hitherto the chronic self-propagative process which is at the root of the diseases called cancerous; and a first preparatory step under your Lordships for the purpose of such an investigation is represented in the fourth of the annexed papers [A]. In it, namely, is the state ment of an interesting study which Dr. Creighton has made, and of which the results are there given, with regard to the earlier signs of cancerous infection in the ultimate anatomical elements of the secondarily infected organs.

Chemical Pathology of the nervous system.

The fifth of the annexed papers [A] belongs to another sphere of study than the four preceding. It contains, so far as yet ripe for publication, the results of a very important and very laborious research, on which Dr. Thudichum has been engaged for more than two years, in introduction to the *Chemical Pathology of the Nervous System*. During the years 1870–2, Dr. Thudichum, in accordance with the general scheme of work which I explained in my 12th Report, had been investigating the chemistry of typhus; but after following as far as then seemed possible the chemical phenomena of that disease, had found that the results of his work could not properly be deemed more than provisional, and that, under the circumstances as they then stood, direct attainment of final results could not be expected. The difficulty was of a sort to which I have already adverted: it consisted in the want of normal chemical standards by which to measure the morbid declensions in typhus. Especially a leading fact in typhus, one which may be in intimate relation to the killing-power of the disease, and which it is on all accounts necessary to have as completely as possible understood, is the fact of the action on the nervous system; and clearly no true chemical knowledge of that morbid action would be possible, till greatly improved knowledge of the normal brain-chemistry should be supplied. Accordingly this task was taken in hand; and of course not with exclusive reference to the one disease which gave immediate occasion to it, but in the hope of eventually obtaining results which should be applicable to all cerebral pathology. I need hardly observe that a research of such interest — an endeavour so to unfold the very complex chemistry of the normal brain as to make the abnormal processes chemically intelligible, must, as regards the interest and importance of its object, rank highly among the exact studies by which physiology hopes to give light to Medicine; but I would particularly note that while certainly it is among the most interesting and important of such endeavours, so it certainly must be counted among the most difficult; and I therefore refer with particular satisfaction to the very remarkable evidences of success which Dr. Thudichum is already able to show.

In addition to bringing before your Lordships the accompanying complete papers, I am able to state that much other and equally important work is at present in progress. Especially I may mention that Dr. Sanderson, who for the last three years has been continuously engaged in studies of the infective processes of common fever and common inflammation, will, I believe, early next year have an instalment of valuable results ready for publication with regard to these investigations*; and that Dr. Klein, who has recently been investigating the minute anatomy of enteric fever, and seems already to have succeeded in identifying for the first time the contagium-particles of that extremely important disease, will also, I believe, early next year have his results in this matter sufficiently elaborated for publication.

In closing my present Report, and with the interest which I must of course feel in whatever tends to strengthen the scientific resources of the Medical Profession, I would beg leave respectfully to congratulate your Lordships on the progress of this work which is advancing under your authority, and to express the gratification with which from time to time I find myself privileged to bring its results before you. Equally to your Lordships who have instituted the work, and to the men of science who under your Lordships are instrumental in conducting it, the reflection must, I think, be satisfactory, that, so far as the Investigations fulfil their primary aim of giving aid and stimulus to the growth of Medical Science in this one country, their success is contributory to knowledges which are of universal human concern, and which ithas therefore ever been the aspiration and the pride of each civilized people to augment for the common good of mankind.

I have the honor to be,

&c., &c.

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* Here I may note that two years ago, in the interval between my two series of reports, Dr. Sanderson reported to me some first results which he had then obtained in regard of the infective products of inflammation; and that with their Lordships' sanction (in order not to delay scientific publication of those results) his paper was communicated to the Royal Medical and Chirurgical Society, who published it in the 56th volume of their Transactions. At Dr. Sanderson's suggestion I do not now annex that paper in its original form, but leave its matter to be incorporated by him in a future more comprehensive report.—J.S.

Scientific Investigations in 1874.*

TO THE LORDS OF HER MAJESTY'S MOST HONOURABLE PRIVY COUNCIL.

MY LORDS,

IN further report on the Scientific Investigations which I have the honour of superintending under your Lordships, I now beg leave to submit the annexed six papers [A], referring to the various sections of work which were in hand during last financial year.

Scientific investigations.

The *first* of them relates to the pathology of that complex bodily disturbance which is known as the *Process of Fever.*

Process of fever.

This process, as regards the width and depth of its practical interest to persons concerned in the treatment of disease, is certainly second to none which the body suffers; for at every turn of medical practice it is apt to present itself for treatment as a more or less prominent part of the patient's total illness, and in a large proportion of such cases is an influence which involves the issues of life or death. In order that the medical treatment of the febrile process should be perfect, the process ought to be thoroughly understood in respect of all the dynamics of its constitution: so thoroughly, indeed, that the bedside practitioner shall be able to apply his counter-agents with the precision of one who conducts a merely physical experiment. Till within very recent times, however, not even the necessity for that degree of insight into the febrile process has been distinctly felt; and though in these latest times the process has been studied in such spirit of exact science as must surely sooner or later eventuate in improvements of practical efficiency, the modern studies, so far as their results have been made known, can hitherto hardly claim to have done more than contribute some preparatory elements towards the complete doctrine of the future.

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* Reports of the Medical Officer of the Privy Council and Local Government Board, New Series, No. VI.

Professor Sanderson, under your Lordships' commission, has during the past three years been spending much time in the investigation of this great section of pathology, and has been gradually making his knowledge of it fuller and more exact. It is scarcely needful to observe that no present treatment of the subject can be regarded as exhaustive and final; but in the annexed paper Dr. Sanderson gives, as instalment, a very elaborate critical exposition of those parts of the subject which he thinks may now be taken as settled.

Inflammation.

The *second* paper, which is also by Dr. Sanderson, relates to the study of *Inflammation* in that extremely important point of view which regards it as an infective process.

Facts which more or less pointedly tend to establish the infectivity of the process of inflammation are familiar in the practice of surgery, and have for many years past been grouped together in that ætiological connexion:* but, with clinical observation alone, the case could not be fully understood; and it was indispensable for the growth of surgery in this direction that the inflammatory process, in its zymotic relations, should be carefully investigated by experiment. The studies which in the years 1867–8 and 1871–2 were made under your Lordships, with regard to the processes of tubercular infection, necessarily had regard to the infective influence of various acute inflammations; and much new knowledge which accrued from them in this respect was embodied by Dr. Sanderson in a special report, completed in the summer of 1872.† Dr. Sanderson has recently made further investigation in the same study, and now reports again on an important section of it; and the annexed paper, which contains his report of the present year, contains also, as requiring to be read with it, and as not before officially published, the earlier report which he presented.

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* Thus, in 1860, in the article "Inflammation," in Holmes's "System of Surgery," it was argued that the evidences then known were enough to prove the essential contagiousness of the process, and the general conclusion was stated as follows: "Inflammatory excitement tends to diffuse itself. Within limits "hitherto not defined, inflammations, both common and specific, are communi- "cable from part to part, and from person to person. *Sympathetic inflamma-* "*tions* are facts of inflammatory contagion. *Inflammatory fever* is a total "bodily infection, wrought by materials from the inflamed part."—Op. cit., first edition, Vol I., p. 92.—J.S.

† At that time (in consequence of departmental changes) the continuity of my annual reports to my Lords of the Council had been interrupted; and therefore, in order not to delay scientific publication of Dr. Sanderson's results, a copy of this paper was, by permission, communicated to the Royal Medical and Chirurgical Society, who printed it in the next (56th) Volume of their Transactions.—J.S.

The prolonged research which is represented in the two parts of the annexed paper has been of extreme pathological and practical interest: partly as an essential contribution to the general study of processes of contagion, but even more as tending to throw new light on those terrible misadventures which arise in surgical and obstetrical practice when infective inflammations develop the malignant forms of traumatic and puerperal fever.

With regard to those disastrous infections, the earlier report gives results which I have already had occasion elsewhere to quote:* broadly to the effect, that apparently those "pyæmic" and "septicæmic" diseases have their common essential cause in one morbid poison or contagium, which, so far as can yet be discerned, is a particulate ferment of ordinary putrefaction, and which, while able to produce those diseases by its intenser action, is also able (as had previously been shown) to produce by less intense action the chronic tubercular infection of the body; and that, in animals, suffering under the acute infection, microzymes, in active process of multiplication, had uniformly been found in the exudation-liquids of the inflamed parts. Dr. Sanderson, however, had also found that inflammations, in order to be most formidably infective, need not have been started by contagion from any pre-existing case of like sort, nor by any immediate inoculation with foreign putrid matter, but might, it seemed, be highly infective merely in accompaniment of being highly intense. And it is at about this part of the subject that the special interest of Dr. Sanderson's later report begins. For, in regard of that compound quality of infectiveness and intensity in inflammation, Dr. Sanderson has now succeeded in clearly showing that it is a quality which may be artificially cultivated; and that, starting from some purely chemical lesion, it can be developed in higher and higher degrees by successive inoculations from subject to subject, till there presently results one of the most tremendous morbid poisons which the mind of the pathologist can conceive.

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* In Nos. II. and III. of the present series of Reports.

Enteric fever.

The *third* paper, which is by Dr. Klein, gives (as foreshadowed in my last report) the extremely interesting results of his investigation of the intimate anatomy of *Enteric Fever;* and Dr. Klein, who fortunately is artist enough to reproduce admirably with his pencil the anatomical appearances which he displays under the microscope, has here, as on former occasions, illustrated his written report with drawings which make the results peculiarly clear.

The paper has its distinctive and very great interest in the fact that it purports to describe for the first time the contagium of enteric fever as something cognizable to the eye: in respect of certain multiplying microscopical forms, apparently of the lowest vegetable life, which are found in innumerable swarms in the bowel-textures and bowel-discharges of the sick; penetrating from the former to diffuse throughout the patient's general system, and teeming in the latter to represent, as this view supposes, the possible germs of epidemic infection.

The most cursory glance cast by the anatomist at the illustrations of Dr. Klein's paper will convince him of the reality of the facts which Dr. Klein interprets to the above effect: and, that the interpretation thus assigned to the facts is the one which they must generally receive is, I think, an inevitable consequence of considerations which were stated in my last report with general regard to agencies of contagion. The enteric fever of man is not yet known to be communicable to any other animal; and it has therefore not been possible to perform in relation to its supposed contagium such experiments as have been made on the lower animals with respect to the contagia of some other diseases. In absence of such experiments, the same degree of certainty cannot at present be expressed with regard to the contagium of enteric fever as with regard to that (for instance) of sheep-pox: but, subject to any correction which experiment may hereafter supply, we may at least accept as approximately proven, that the contagium of enteric fever has its essence, or part of its essence, in the microphyte which Dr. Klein has discovered; and that here accordingly is a further illustration of the general doctrine which I have noticed on many previous occasions, with regard to the significance of specific organic forms in the constitution of specific contagia.

In an immediately practical point of view, much interest attaches to Dr. Klein's remark that the microphyte which he describes in the present paper closely corresponds with that which Professor Cohn, the eminent micro-botanist, described, under the name of Crenothrix polyspora, as found by him "in the well-water of a certain district in Breslau, famous "for the frequent occurrence of enteric fever among its "inhabitants."

Cancer.

The *fourth* paper, which is by Dr. Creighton, reports the continuation of the research in which he has been engaged, in introduction to the ætiology of *Cancer*.

In agreement with general principles which modern pathology illustrates more and more strongly in proportion as its own progress advances, and the importance of which is asserting itself to the utmost in the present matter, it had appeared that, before there could be any reasonable hope of understanding for preventive purposes the dynamics of the production of cancer, there was need, in the first place, that the process of the disease should admit of being identified in the earliest movement of its divergence from health; and therefore that, in regard of any organ in which the disease had to be investigated, the observer should know with absolute accuracy the normal texture-changes of the organ.

Dr. Creighton has for the past two years been working in that sense at the genesiology of cancer: working, namely, from the point of view which regards, as first matter for interpretation, the finer anatomy of the disease. His report of last year gave the results of a very careful study of the beginnings of cancer in organs secondarily affected by it, as specially in the liver; and in that report he not only expressed very definite conclusions as to the mode of origin of the secondary tumours—both as to the anatomical elements in which they begin and as to the physiological analogies of their beginning, but intimated also that the observations which he had made in that respect were in his opinion highly suggestive with regard to the probable mode of origin of the primary disease. In the report of the present year, account is given of a very thorough following of that line of suggestion so far as relates to one organ of the body; namely, *the Breast;* an organ, the interest of which in the present context may be ranked as of the highest order. In the first part of the paper, Dr. Creighton reports the results of his investigation (far more exact than had ever previously been made) with regard to the development of the mammary gland, and to the processes of change which the adult female breast normally undergoes in its alternations of activity and rest, and to the relations of the lymphatic system to these changes; and in the second part of the paper he exhibits the development and infectiveness of primary cancerous tumours of the breast as standing in the clearest connexion with the morphological history which he has premised.

Chemical Pathology of the nervous system.

The *fifth* paper relates to that branch of the Investigations which is in the hands of Dr. Thudichum, and which consists distinctively in the chemical division of our subject-matter.

Dr. Thudichum during the past year has been very actively continuing the great research on which he reported a year ago in introduction to the *Chemical Pathology of the Nervous System;* but, as regards this further work, he is not yet prepared to do more than report provisionally some of the more interesting separate results which have been obtained. Of these the chief refers to the existence of Alkaloids in the Brain, and specially of one alkaloid which has properties of a new type. Incidentally to the investigation of the brain-alkaloids, Dr. Thudichum had to acquire more exact knowledge as to the distribution of alkaloids elsewhere in the animal body; and in his annexed paper he briefly records the results which he thus got in relation to muscular tissue, and to milk and albumen and urine.

Disinfectants.

The *sixth and last* paper of the annexed series is by Dr. Baxter, who reports in it the results of an experimental study which he has made of the amenability of certain contagia to control by certain officinal *Disinfectants.*

Last year, when I was reporting to the Local Government Board, on some of the chief infections which prevail in this country,* practical considerations obliged me to point out in regard of them (and the same observation applies generally to infectious disease) that much procedure which popularly passes among us under the name of "disinfection," is but the most futile of ceremonies; and in contrast with such, I referred to the very real services which might fairly be expected from Chemistry, if skilfully used within its appropriate sphere of operation. It is in relation to individual cases of infectious disease, and in endeavours to secure in detail (so far as possible) the immediate neutralisation of the infectious matters which come from the sick, that Chemistry has its chief opportunities of subserving preventive medicine; but in any such endeavours for disinfection, everything must turn on the accuracy and completeness with which each prescribed performance is done; and it is evident that prescriptions for disinfection ought to have the same sort of exactness as prescriptions which are for therapeutical purposes. Exactness such as this is only possible in proportion as the disinfection-value of each disinfectant has been ascertained by process of strict experiment, duly varied according to varying circumstances; but hitherto, even with regard to the agents which are most largely in use, experimental knowledge has been almost altogether wanting; and even the best of our so-called "disinfections" with regard to products of disease have rested rather on theories of chemical analogy than on true knowledge in the actual subject-matter.

Dr. Baxter's investigation has been intended to illustrate, with a view to more general application, the method of study which this branch of medicine requires; and with that intention, it was carefully planned by him with Dr. Sanderson. Moreover, so far as the investigation could go (but this on a first occasion could not be very far) it has been intended to supply, in regard of certain cases, the precise experimental knowledge which is wanted as a basis for practical rules.

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* New series No. II.; on Filth-Diseases and their Prevention.

The agents with which Dr. Baxter has experimented are four: viz., permanganate of potash, sulphurous acid, chlorine, and carbolic acid. The morbid contagia on which the disinfection-value of these agents has been tried are three: those, namely, of vaccinia, of glanders, and of intensified (infective) inflammation; and, for reasons which are well explained in the paper, Dr. Baxter has made similar proof of each of the four agents in relation to the microzymes of common putrefaction. Within this area of experiment, some very exact results have been obtained by Dr. Baxter; and though, in our present infancy of knowledge as to contagia, we clearly are not entitled to assume that the four agents with which Dr. Baxter experimented would have in relation to all other contagia the same disinfection-values as they shewed in relation to those on which he tried them, his results may, I think, at least be regarded as highly suggestive in that wider sense, and as offering to medical practitioners far more exact clues than they have yet had towards a judicious selection and proportioning of the means with which they shall aim at disinfection.

In concluding this brief introduction to the papers which I have the honor to submit, I would beg leave, my Lords, to express my conviction that they are contributions of substantial value towards the important objects for which your Lordships are empowered by Parliament to incur the cost of the Investigations, and that both here and in other countries they will be highly appreciated in that sense by persons who themselves are engaged in giving growth to the Medical Sciences.

I am, my Lords,
&c., &c.

Scientific Investigations in 1875–6.*

TO THE LORDS OF HER MAJESTY'S MOST HONOURABLE PRIVY COUNCIL.

My Lords,

In accordance with the desire which your Lordships, on my retirement from office, did me the honour of expressing to me, that, when the various reports which were yet to accrue from the Medico-Scientific Investigations of last financial year should be complete, I (though no longer in office) should fulfil the agreeable duty of seeing to their passage through the press, I submit the present volume to your Lordships; and as the date of my doing this is by some months later than I had hoped it would be, I beg leave to state that the completion of the printing has been delayed by circumstances not in my control.

Scientific Investigations.

1. The first report which the volume contains is a further contribution by Dr. Sanderson to the study of the Morbific Ferments.

Morbific Ferments.

It relates particularly to the common ferment of putrid infusions,—a ferment which, besides having power to excite putrefaction in dead animal matter, has (as former of these reports have shown) very definite toxical relations to the living animal body. Dr. Sanderson now shows that, if infusions which have the septic ferment in them be passed under pressure through porous porcelain, the filtrate (which after such filtration has no microphytic organisms in it) will now not undergo any further zymotic process in itself, and, if introduced into the living body, will not exercise any morbific influence on it. These results have at least an important negative bearing: for, had contrary results been obtained, and had the septic liquid been shown to contain its characteristic ferment in the mechanically-inseparable state of true solution, this fact would have conflicted with our opinion, previously expressed, that the morbific ferments are essentially particulate, and probably have their essence, or part of their essence, in the multiplying organic forms (microzymes) which they contain.* But while the verdict is to that extent distinctly in favour of the previous opinion, the test cannot, I apprehend, be considered unambiguous for purposes of positive argument, till we know for certain that the filtration-process, which obviously does arrest all visible particles, does not at the same time effect any other change which can be deemed essential in the liquid which goes through the filter.

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* Report of the Medical Officer of the Privy Council and the Local Government Board, New Series, No. VIII.

This report from Dr. Sanderson represents all that his other engagements would allow him to do in the way of scientific investigations under your Lordships during the year 1875–6; and I much regret to have to state that, at the time when my own official connexion with the Department was ending, Dr. Sanderson had found himself unable to accept any commission under your Lordships for the year which is now drawing to its close.

Sheep-Pox.

2. The next three papers in the volume are by Dr. Klein. The first of them [A] is a short memorandum in which he refers to his previous report on Sheep-Pox, and rectifies a very important error of interpretation in that report. It had chanced that Dr. Creighton, while studying preparations which he had made of glandular textures for the purpose of his own researches in Cancer, came on appearances so similar to some of those branching forms which had been found by Dr. Klein in the skin-eruption and skin-lymphatics of variolus sheep, but at the same time so certainly due to his own method of anatomical preparation, that he was led to believe that Dr. Klein's interpretation of the sheep-pox appearances had been in part erroneous; and upon his doing

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* As regards the component parts of the previous opinion, it will be observed that Dr. Sanderson in the present paper, though apparently still supposing that the septic ferment is particulate, seems to regard as proven by Professor Panum's experiments, as well as approximately by his own, that it "does not "consist of living organisms." I think it better not to attempt on the present occasion to follow any of the lines of consideration which suggest themselves with regard to that distinction.—J.S.

me the favour of drawing my attention to the supposed fallacy, which I at once brought to Dr. Klein's notice, Dr. Klein returned to his examination of the variolous specimens, and eventually came fully to recognise that Dr. Creighton's contention was just. The effect of the above correction is to set aside as mistaken those parts of Dr. Klein's paper which represent the higher fungic structures, mycelium and gonidia, as existing in variolous skin; and on consideration of all the circumstances, I am disposed to think that provisionally we ought to regard this correction as applying also to certain parts of Dr. Klein's paper on enteric fever, and as invalidating, till further examination shall have been made, the descriptions which he there gives of higher fungic forms in the follicles of the diseased intestines. Dr. Klein is confidently of opinion that the correction does not in either case affect those parts of his description which represent the diseased textures as pervaded by swarms of micrococci; and this is also the opinion of Dr. Sanderson, under whose superintendence the former researches were made; but as it will, I think, clearly be convenient that Dr. Klein should at the earliest opportunity re-write, under the present correction, his account of the morbid anatomy of the two diseases, I would suggest that, in preparing to do this, he should re-examine, so far as any doubt could be raised, the whole ground of the former investigations.

As regards the curiously fallacious microscopical forms by which Dr. Klein was misled, I think it due to him to state that not only did those forms lead other skilled animal-histologists who saw them to concur with him in believing them to be extrinsic organisms, but that also botanists of the highest European authority accepted them without demur as truly fungic.

Scarlatina.

3. Dr. Klein's next paper [A] gives the results of an elaborate investigation he has made of the intimate anatomical changes which arise in various organs of the body during the progress of severe Scarlatina.

His results, so far as the investigations have gone, do not seem to me to justify any final opinion with respect to the nature of the scarlatinal contagium; but the detailed illustrations which he gives of the peculiar working of the infection in a great variety of organs seem to me a very interesting addition to previous knowledge, both as regards the scarlatinal infection in particular, and as regards febrile infections in general. In these points of view I would especially draw attention to the evidence which Dr. Klein seems to find that scarlatina tends to produce widely-diffused textural changes in the walls of bloodvessels,—a hyaline swelling of the texture of capillary vessels and of the inner layer of minute arteries, and also an abundant growth of new elements in the contractile layer of the arterioles: changes which (as affecting the perviousness and contractility of the vessels) may of course, in their turn, be productive or partly productive of other lesions.

I would connect Dr. Klein's observation of these changes, as incidental to scarlatina, with his previous but less elaborated observation of like changes in cases of enteric fever. Diffused bloodvessel-changes, started in that inner surface of the vessels which has immediate contact with the circulating blood, can hardly not be ascribed to the blood as their cause; and moreover, in both the diseases here referred to, grosser blood-change is occasionally attested by clots which form in the course of the circulation, and become impacted as plugs (so-called *emboli*) in the smaller vessels. The tendency to form "emboli" is known to be likewise an attribute of the septic infections; and at least in them it seems certain that the clotting-process is determined by minute masses of shaped zymotic material which act as nuclei for such concretion.

Dr. Klein has not hitherto found in scarlatina anything which he can confidently regard as a microphytic contagium; for, though he no doubt did see, in some cases, in special combination, an abundant presence of well-marked micrococci, this was only where the circumstances rather favoured a supposition that the micrococci were of secondary occurrence; and he for the present reserves his opinion with regard to the doubtful appearance of micrococci which he found in the scarlatinal skin at an early stage of the disease.

Swine Fever.

4. Dr. Klein's final paper[A] is a summary account of some studies which he has made of a certain infective Fever of Swine. The special reason for this research was that the disease in question had been supposed to be identical with the enteric fever of the human subject; and hope was entertained that therefore our studies of the human disease might be usefully supplemented by studies of the brute. In the event this hope was not realised: for Dr. Klein's research soon showed that the two diseases differ in respects which appear to be essential, and the human disease therefore cannot for the present be studied in other than its human relations. But the research, though in that respect fruitless, has given results which in other ways are of much interest, both as contributing to veterinary practice the more exact knowledge of an important disease of live stock, and also as adding a very interesting new illustration to zymotic pathology in general. In the latter point of view I would draw particular attention to Dr. Klein's description of the state of the lungs and pleura in this pig-disease, as regards the plugging of pulmonary blood-vessels and lymph-vessels, as well as small air-tubes, with micrococci, and as regards the extraordinary diffusion of micrococci on the surface of the serous membrane.

Cancer.

5. In the fifth paper of the present volume[A] Dr. Creighton reports on such further studies of Cancer as he had made down to the end of the financial year. The report is a chapter in the natural history of those ineradicable and indefinitely-advancing infective growths which in surgical practice are emphatically called "malignant;" and it particularly relates to the intimate anatomical changes which arise in lymph-glands, when cancer, operating from some spot in which it has been of primary occurrence, secondarily spreads its infection to them.

In explanation of the fact, familiar in pathology, that, in the consecutive extensions of cancer in a given affected body, the secondary and tertiary tumours tend to repeat with an exact mimicry the special pattern of the primary tumour, pathologists have had two different surmises as to the nature of the secondary and subsequent processes: one, that such acts of infection are merely of the nature of a transplantation or botanical grafting-process,—that effluent living elements of the primarily-diseased parts, passing into streams of lymph or blood, and carrying with them a strong germ-power of their own, grow indefinitely on their original plan, and as parasites, in the parts to which they are floated, and in which they chance to take root; the other, that not a mere transplantation, but a zymotic process, is signified by the extensions of cancer,—that the elements of the primarily-diseased part have in them a specific ferment-power, by which, if lymph-stream or blood-stream carries them to another part, they enforce on that part, as with a kind of impregnation, that it, deserting its own former textural type, shall grow in a new way with new endowments, so as to become in form and ferment-power a repetition of the parent tumour. The former of these two opinions was that which, before the beginning of Dr. Creighton's researches, was, I believe, the more generally entertained in this country,* and, while nothing was shown to the contrary, might easily have been judged the more probable (because apparently the simpler) explanation of facts: but Dr. Creighton's report of 1874, on the development of secondary cancer-nodules in the liver, pointed decidedly to the other conclusion; and his present report, on the cancerisation of lymph-glands, speaks again in the same sense. He had, it is true, one class of cases in which he could identify in the diseased lymph-glands characteristic forms, derived in considerable quantity from the primarily-diseased part; and in this class of cases, taken alone, it no doubt was difficult or impossible to determine whether given tumour-forms existing in the lymph-gland were mere colonists derived (with or without multiplication) from the primary disease, or were an essentially new generation to which the gland itself, by reason of its being infected, had given rise. But the ambiguity which in such cases attached to the phenomena because of the large quantity of the foreign material was, in cases of a different class, comparatively absent. In some cases, namely, material which could be identified as coming from the primary disease was present in given lymph-glands in but so small quantity that the behaviour of the individual migrants, or of separate little groups of them, could be advantageously studied; and in the very valuable set of observations where this was done by Dr. Creighton, he saw no signs as of migrants preparing to pass by mere self-augmentation (after the manner of vegetable grafts) into the new growth which was to follow their arrival. On the contrary, in observations which appear to have been the most instructive of the series, migrants, when they had attained their fullest type of character, seemed merely to undergo dissolution in contact with the gland-soil onto which they had been cast; perhaps diffusing into it at the point of contact as the spermatozoon into the ovum which it impregnates; while, contemporaneously with this their dissolution, the contiguous portion of gland-substance straightway began to show in its individual elements that it had become subject to an alien power, under which it must pervert its own growth to those new and destructive issues which are common to cancerised organs. And Dr. Creighton's observations to that sort of effect acquire an additional importance when they are considered in conjunction with a third set of observations which he describes: cases, namely, in which the infected lymph-gland not only gave, so far as he could see, no evidence of having received shaped migration from the primary disease, but in which moreover the signs of its incipient secondary infection were diffused in it so generally and so equably as almost to exclude the thought of mere transplantation.

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* See, for instance, the very interesting discussion which was held on the subject of Cancer two years ago at the Pathological Society of London, and particularly the admirable paper with which the late Mr. Campbell de Morgan then introduced the subject for debate.—*Path. Trans.*, Vol. 26.—J.S.

It seems to me of great interest to pathology, in some of its most promising relations to the future improvement of practice, that researches like these which Dr. Creighton has begun should be followed to their very utmost yield; and in view of the high qualifications with which Dr. Creighton had been prosecuting these researches, I found cause for particular regret in learning from him towards the close of the year's work here reported on that I might not propose to your Lordships his further continuance in the work.

Chemical Constitution of the Brain.

6. The last paper [A] in the present volume is by Dr. Thudichum, continuing his former reports by a provisional account of certain further studies which he has made of the Chemical Constitution of the Brain. Though Dr. Thudichum's work in this investigation has been and is continuous, yet, having regard to its very great extent and its extraordinary difficulty, he does not anticipate that for the next two or three years he will be in a position to give his concluding report on it—a report as comprehensive as that which he submitted two years ago, and containing also his pathological applications of the study; but pending this completion of the entire scheme, there are results of each year which admit of being separately stated; and, just as last year so again now, Dr. Thudichum has presented an interim report with much highly interesting detail in it.

The report chiefly occupies itself with the intimate chemistry of certain of the complex bodies which were described in the former report as immediate principles of the brain, particularly of those of the so-called *cerebrine* (nitrogenous) series; studying, in regard of each such principle, what is its exact eventual yield of elements, and what its exact process of break-up, under artificial chemical treatment. The general importance of this kind of study, as conducing to the interpretation of the chemical changes which are effected by disease in the living body, and as indeed often an indispensable clue for such interpretation, is, I believe, now generally recognised among pathologists; and there are points in the present paper which seem to me strikingly to illustrate it. Thus, the fact, now clearly established by Dr. Thudichum, that sugar is apt to arise as one of the decomposition-products of cerebrine, is highly suggestive in relation to the familiar occurrence of so-called "amyloid bodies" in the diseased nerve-centres of persons who have suffered certain sorts of paralysis, and perhaps also (in a different way) in relation to one interesting section in the obscure ætiology of diabetes; and, in another direction, it is equally suggestive to find that the new crystalline alkaloid which Dr. Thudichum exhibits as a product of brain-destruction, appears to be of intimate affinity with certain chemical compounds which are known as contents or derivates of bile.

Finally, my Lords, adverting to the fact that my tenure of office under your Lordships did not terminate till nearly two months after the end of the period to which the foregoing report relates, I believe it may be right for me here to state that, during these two months, no work, except such as was of the nature of continuation-work, was undertaken in this branch of your service: for your Lordships had, for parliamentary reasons, determined that you would not till late in the session move Parliament for the usual annual grant for the Scientific Investigations; and under these circumstances the programme which I had in readiness for your Lordships' consideration, with regard to work to be done in the new financial year, necessarily remained in great part in abeyance. I may perhaps be permitted to mention that, among the diseases which I was hoping this year to submit to systematic investigation (in addition to those in regard of which our previous work had to be continued or extended) the first was Rheumatic Fever; and I would also mention that our studies of the obscure problems of zymotic pathology had at so many points (as various sections of the present volume may illustrate) made us aware of the insufficiency of present knowledge of the Natural Ferments of the living animal body, that I was further hoping with your Lordships' sanction to initiate a systematic study of this very difficult physiological subject-matter.

Though now myself removed from further active participation in the medical service of the State, I must continue to feel warm interest in whatever shall promote the progress of that service; and your Lordships, graciously crediting me with this, were so good as to inform me, on my leaving office, that Government intends to continue these investigations.

The connexion of them with your Lordships' Medical Department was always felt by me, while in office, as an invaluable aid, co-operative and consultative, in directions where my own working-power (under prior claim of other engagements) necessarily fell short of my wishes; and I daresay that, by my successors under the Local Government Board, the privilege of the official association with scientific research will be appreciated as highly as it was by me. As for the general value and promise of that kind of work in its bearing on the progress of Medicine, I entertain the strongest conviction that, in regard of all antagonism to disease, whether with preventive or with curative measures, and whether by official or by private hands, Medicine's best prospects of increased success are inseparable from such studies of exact science, and that, in proportion as the pathological insight becomes more clear, the growth of practical power will certainly follow. The investigations which have been made under your Lordships' authority have, I need hardly say, only pretended to deal with selected portions of the vast subject-matter of Pathology. Their distinctive aim (as explained in a former report) has but been to supplement, in particular matters and methods of research, other and ordinary agencies of medico-scientific progress: in directions, namely, where research, if it is to succeed, requires systematic and continuous labour extending over long periods of time—labour, not only inconducive to immediate pecuniary profit, but perhaps involving much cost; and where, such being the conditions, it can hardly be expected that the study, however great its eventual importance, will be adequately cultivated by private investigators. That the investigations, instituted by your Lordships on that limited basis, have even in these few years been of very real instructiveness to the Medical Profession in this country, and that, besides such direct gain of knowledge as they have given, they have very greatly stimulated the general spirit of pathological investigation among us, will not, I believe, be questioned by anyone who knows the medico-scientific records of the time; and in view of their intended continuance, I would express to your Lordships, though now but as an individual practitioner, my thankfulness for the aid which Government will thus be giving to the culture of the Profession to which I belong.

I have the honour to be, my Lords,
Your Lordships' obedient humble servant,
JOHN SIMON.

CONTAGION.

[The following article on CONTAGION is reprinted from Quain's *Dictionary of Medicine* by the kind permission of Messrs. Longman. In 1876, before leaving office, Mr. Simon had intended to write, in the form of a Report to the Local Government Board, a synoptical paper on the public-health relations of Contagion, such as he had previously written on the subject of Filth Diseases. Mr. Simon's retirement from office, somewhat earlier than he had expected, prevented him from giving effect to that intention; but, two years afterwards, being asked by his friend, Dr. Quain, to write the article "Contagion" for the latter's *Dictionary of Medicine*, he, at that opportunity, put into shape most of the thoughts he would have expressed in a formal Report.—ED.]

CONTAGION.

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THE word CONTAGION is applied in pathology to the property and process by which, in certain sorts of disease, the affected body or part causes a disease like its own to arise in other bodies or other parts; and the Latin word *contagium* (pl. *contagia*) is conveniently used to denote in each such case the specific material, shown or presumed, in which the infective power ultimately resides.

The property of CONTAGIOUSNESS belongs to a very large number of the diseases which affect the *human* body. And in more than this direct way the property is of great interest to mankind. Contagiousness of disease is a fact not only for man, but apparently for all living nature; and the influence of contagion in spreading destructive diseases among *domestic animals*, and among those parts of the *vegetable kingdom* which contribute to the nourishment of man, is such as to make it of immense social importance that the laws of contagion should be well studied and understood. Further, just as contagion in the case of *living* bodies and their parts spreads disease from one to another, so, to an immense extent, in the case of certain matters which, though of organic origin, are *not living*, it spreads various processes of decay. The so-called "fermentations" which yield alcohol and vinegar, as well as that in which putrefaction consists, are contagious affections of the respective matters in which they occur: every cheesemonger knows that moulds of different kinds spread by inoculation, each in its own kind, from cheese to cheese; and if the Greek proverb "grape mellows to grape" is true of the living fruit, the apple-loft gives analogous experiences of contagion among the fruit which is garnered:

The RATIONALE of the word "contagion," as now used, is that the property is understood to attach itself essentially to a material *contact;* not necessarily that, when infection is spread from individual to individual, the contact of the individuals

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must have been *immediate;* but that in all cases there must have been such passage of material from the one to the other, as was in itself at least a *mediate contact* between them. And similarly, in those very instructive illustrations of the process of contagion which are furnished within the limits of a single diseased body by the propagations of disease from part to part of it, we can in general easily see that infection advances from part to part, either in proportion as part touches part, or in proportion as the one receives from the other the outflow of lymph or blood or secretion.

The various SPECIFIC MATTERS which effect contagion in the living body, the respective "contagia" of the given diseases, seem all to have in common this one characteristic; that in appropriate media (among which must evidently be counted any living bodily texture or fluid which they can infect) they show themselves capable of *self-multiplication;* and it is in virtue of this property that, although at the moment of their entering the body they in general do not attract notice, either as objects of sense or as causes of bodily change, they gradually get to be recognisable in both of these respects. Now, the faculty of self-multiplication is eminently one of the characters which we call *vital;* and when it is said that all contagia are self-multiplying things, this is at least very strongly to suggest that perhaps all contagia are things endowed with life.

In order to any general consideration of the question thus suggested, contagia may conveniently (even if but provisionally) be distinguished as of two main CLASSES, differing, or at present seeming to differ, from each other in their mode of action on the organisms which they infect: one class, namely, that of *Parasites*; and the other class, that of the true or *Metabolic Contagia.* Of this separation, so far as present knowledge seems to justify it, the assumed grounds are: that each true Contagium, in proportion as it multiplies in the body, *transforms,* in a way which is specific to itself and is different from the ways of other contagia, the bodily material with which it has contact; while, on the contrary, the Parasite, however much it may grow or multiply in the body, produces no qualitative effects specific to itself, but only such effects as are

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of common kind to it and all other parasites—indications, namely, of its *mechanical intrusiveness* in the parts which it occupies, and sometimes of the *drain* which it makes on its host's general nutritive resources.

A.—Of PARASITES, in relation to processes of contagion, little needs be said in the present article. When an organism or part of it is, in greater or less amount, inhabited by other organisms, animal or vegetable, which subsist on it, or its food or refuse, it of course may be a centre of infection to other (if susceptible) bodies or parts, to which it can transmit live parasites or their germs or seeds: for, when this transmission takes place, growth and self-multiplication, as in a colony, are the natural results which have to be expected; and in proportion as these occur, the newly-infected body or part gradually gets to suffer, like the old, from those particular derangements which make the type of parasitic disease. Some parasitic diseases, especially some of those of the skin, spread actively by direct contagion in ordinary intercourse; as for instance scabies, by the migration of its acari, and porrigo (among children) by the spores of its microphyte; and the spreading of such diseases where they exist may of course be to any extent facilitated by aggregation of persons and uncleanliness of personal habits. There are cases in which parasitic disease spreads from animal to animal only in proportion as the one feeds on the other, and eats it with parasites still living in it; or in proportion as live parasite-eggs or larvæ, discharged from the body of one animal, get conveyed with food (especially on raw herbage and in water) into the bowels of another. Considerable epidemics of trichiniasis in the human subject have been traced, chiefly in Germany, to infection from the pig; in cases where pork, abounding with trichinæ, has been eaten, as sausage-meat or otherwise, in a raw or imperfectly-cooked state: and in Iceland the very great sufferings of the human subject and the cattle from echinococcus have been traced to the influence of the dogs in spreading contagion from the slaughter-house, where they eat hydatidised offal, to the kitchen-gardens and water-sources and pastures, where they discharge tape-worm eggs from their bowels. *See* PORRIGO, SCABIES, TRICHINA, HYDATID, &c.

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The DISEASED STATES which consist in being colonised by parasites are diseases of indefinite duration, tending in some cases to indefinite increase. In cases where the disease consists in the presence of swarms of blood-sucking or otherwise exhausting animal parasites, symptoms of the blood-drain will of course gradually arise; but otherwise the parasite, whether animal or vegetable, operates only as a mechanical presence. Skin and mucous membrane will be irritated in their superficial layers, and in some cases more deeply, by the animal or vegetable parasites which breed on or in them, just as they might be by dead mechanical irritants: solid organs having cystic entozoa in them will in like manner show evidence of irritation by encapsulating the colonists; and the surrounding tissue will of course suffer compression and displacement in proportion as the colonisation (*e.g.* in case of echinococcus) is compact and massive. In the case of trichiniasis—but, in our ordinary experience, in no other—the multiplication of the parasites, the burrowing of their young, and the general diffusion of these in the body, are processes of such extreme activity that, if the quantity of contagium taken into the stomach has been large, the innumerable local irritations suffice to make a very acute fever; but even in this extreme case, the merely irritative type, though exaggerated, is essentially preserved.

As different sorts of animals are notoriously liable to different sorts of parasites, so, even among animals of one sort, as for instance in the human kind, the LIABILITY of different bodies to receive particular parasite-infections, does not seem to be quite equal for all. Especially, the vegetable parasites seem to have their affinities determined or modified by the general state of health of the recipient; and there are cases in which it looks as if there ran in particular family-lines (perhaps with some slight chemical idiosyncrasy) a special liability to particular intestinal worms. There, however, is no reason to believe that in regard of the more important animal parasites, as particularly of trichina and the tæniadæ, the susceptibility of individuals to attacks is other than universal and practically equal.

B.—The true or METABOLIC CONTAGIA (to which the rest of the present article will exclusively refer)—the contagia which,

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in their respective and specific ways, operate *transformingly* on the live bodily material which they affect, are perhaps the most important of all the incidental physical influences which concern mankind. Whether they may all, at some time hereafter, admit of being named, like the parasitic contagia, in terms of biological classification, is a question which needs not in the first instance be raised; for meanwhile the identity of each separate true contagium is settled in experimental and clinical observation by the uniformity of the operation of each on any given animal body which it affects. Each of the diseases propagates itself in its own form in as exact identity, as if it were a species in zoology or botany; and in each such repetition of the disease there is a multiplication—always a large, and sometimes an inconceivably immense multiplication, of material which has the same infective property. Evidences innumerable to that effect are under daily clinical observation in this climate in instances of small-pox, measles, scarlatina, whooping-cough, enteric fever, mumps, typhus, syphilis, cow-pox, diphtheria, erysipelas, hospital gangrene, purulent ophthalmia and gonorrhœa, venereal soft-chancre and phagedæna, &c.: for, barring fallacies, no man ever sees any one of those diseases produced by the contagium of any other of them; and any man who has before him a case of any of them can see that, however minute may have been the quantity of contagium by which the disease was started, the patient's diseased body (part or whole) yields for the time an indefinitely large supply of the specific agent. It is more or less habitual to some of the diseases that the infectedness of the patient is first made known to the observer by such *general pyrexia* as tells of change already far advanced in the circulating mass of blood; and it is only after this has shown itself, that other symptoms, adding themselves to the fever, complete the more or less complex type which establishes the identity of the disease. But in many of the diseases it may be the case (either naturally or as result of experimental infection) that the first, and in some diseases the main or even the only, effects of the contagion are *local changes*, passing where we can from the first observe them; and the broad facts of metabolic infection, as regards waste of bodily material with concurrent increase of contagium,

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are, in many such cases, among our most familiar experiences. Most instructive, too, are the facts of contagion which are to be learnt in the study of tubercle: the contagium, introducible either by tubercular and certain septic inoculations through the skin, or internally by the infective action of the milk or diseased organs of tubercular animals if taken as food; and the contagium, when introduced, gradually spreading as it multiplies, and as lymph and blood carry it from the first infection-spot to other organs which now will repeat the process. And similarly in cancer (though the primary disease is at present of unknown origin and cannot be created by experiment) the repetition of the primary disease in secondary and tertiary propagations in the body of the sufferer is one of the most striking of all evidences of contagion; because of the great number of structural types which pass under the name of cancer, and the fidelity with which each of them is reproduced in the organ to which the contagion extends. A further fact of contagion, deserving notice in the present context, is the local spread of certain of these processes by continuity of tissue; as, for instance, in the continuous extension of phagedæna or hospital-gangrene from any centre of first inoculation, or of tubercular softening or cancer at the place where it begins; a mode of extension which indicates successive infective actions of matter on matter in spheres of ever-widening circumference;* and the like of which, but in rudimentary degree, may be traced in the areola of any acute inflammation.

In the physiology of the metabolic contagia no facts are more characteristic or more important than those which show the RELATIVENESS of particular contagia to PARTICULAR RECEPTIVITIES of body. First, and in intimate connexion, as would seem, with a *chemical electiveness* of action which will presently be imputed to contagia, there is the preference which some particular contagia (however introduced into the system) show for particular *organs* of the body; so that, by the exercise of this preference, there is given to each of the diseases its own set of clinical and anatomical characters.

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* Compare Tennyson's

"little pitted speck in garnered fruit,
Which, rotting inward, slowly moulders all."—J.S.

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Compare, as instances in this point of view, the respective local affinities of small-pox, enteric fever, mumps, syphilis, hydrophobia, &c.—Secondly, it may be noted that, in regard to some of the contagia, different *persons,* and particularly persons of different *family-stocks,* show original differences of susceptibility; original, namely, as distinguished from others, hereafter to be mentioned, which are acquired; so that, for instance, the severity with which scarlatina or diphtheria will strike in particular families contrasts with a comparative mildness of the same disease in other families, or perhaps even with cases of apparently complete personal immunity under exposure to the particular danger: and recent researches have seemed to suggest as possible that, in the very wide differences of degree with which tubercular disease prevails in different families, an essential condition may be, that the families have widely different degrees of original predisposition towards some of the septic contagia.—Thirdly, there is the extremely suggestive fact with regard to many of our best-known febrilising contagia, that they run a course of *definite duration,* and that in this course, provided the patient do not die, all present, perhaps all future, *susceptibility to the particular contagium is utterly exhausted from the patient;* so that re-introduction of the same contagium will no more renew that patient's disease than yeast will excite a new alcoholic fermentation in any previously well-fermented bread or wine. The inference from this fact seems unavoidable, that each such contagium operates with a chemical distinctiveness of elective affinity on some special ingredient or ingredients of the body; and that exhausting this particular material in febrile process, which necessarily ends when the exhaustion is complete, is the bodily change which the contagium "specifically" performs.—Of not all metabolic contagia, however, can it be said that their operation runs so definite and self-completing a course. For, first, there are particular *acute infections* which, as a rule, kill; either (as appears to be the case in splenic fever when affecting man) because of the extreme magnitude of the transforming process which the contagium sets up, or else (as appears to be the case in hydrophobia) because the elective incidence of the contagium is on an organ indispensable to life; so that in such cases there is in fact hardly such an event as passing alive through the whole process of the disease. And secondly, there are the *contagious dyscrasies* which are clearly characterised by their tendency to indefinite duration: syphilis, which oftener than not relapses in successive outbreaks, and often as years pass invades the body more and more deeply, and may after all never during life be ended; and tubercle and cancer, which, with almost invariable persistence, will in general steadily advance month by month to infect more and more of the body till the process eventuates in death.

The transmission of various contagious diseases IN COMMUNITIES is of course greatly influenced, both in detail and in aggregate, by such differences of individual receptivity as were mentioned in the last section. Notably, as regards communities through which particular acute infections have had full run, fresh sparks of the contagium may find little or no fuel on which to act; and much new diffusion of the disease may not again be possible, till immigration, or births, or lapse of time operating in other ways, shall have reconstituted a susceptible population. And, given the susceptible population, circumstances of time and place are infinitely various (especially as regards quantity and quickness of personal or quasi-personal intercourse) in determining how far this population shall have particular contagia thrown in its way.

Also there are conditions, not primarily of a personal kind, which operate on a very large scale in determining the spread of some of the metabolic infections: giving to them respectively *at certain times*, in ways not hitherto understood, a *special increment of spreading-power*, and in some instances also *special malignity:* and thus enabling them respectively from time to time to come into comparative prominence in national life, and perhaps at once or successively in many different countries, in the form of so-called EPIDEMICS. Thus, it is matter of familiar knowledge that the fevers which are most habitual to this country, scarlatina, measles, small-pox, enteric fever, are of nothing like uniform

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prevalence,—that scarlatina, for instance, will be three times as fatal in one year as in another, and that small-pox is liable to even greater exacerbations: and it is known that temporary differences of this kind are not exclusively local, —that, for instance (to quote a late official report) "the "epidemic of small-pox which began in England towards "the close of 1870 and terminated in the second quarter "of 1873 was part of a general epidemic outbreak of "that disease, of world-wide diffusion, marked wherever it "occurred by an intensity and malignity unequalled by any "previous epidemic of the disease within living memory." The wider the survey which we take of epidemiology, the more certain it becomes to us, that, outside the conditions which are independently personal or local, there are *cosmical conditions* which have to be considered. Doubtless there are great epidemiological facts—such, for instance, as the first spreading of small-pox to America, or in our own times the increasing frequency of Asiatic cholera in Europe, which may be ascribed to novel conditions of international intercourse: but there are others, equally great, to which apparently no such explanation can be applied. For what reason it is that cholera every few years has its definite fit of extension in India,—or why diphtheria, which scarcely had a place in history till it overran Europe in the 16th century, and which since then had been rarely spoken of, began again some twenty-odd years ago to be comparatively important in England,—or why the plague of the Levant has for the last two centuries been so unfamiliar to us,—or why the yellow fever of the Mississippi has in particular years raged furiously in parts of Europe,—or why our black-death of the 14th century, though apparently still surviving in India, has never but that once been in Europe,—or whither has gone our sweating-sickness of three centuries ago,—or whence have come the modern epidemics of cerebro-spinal meningitis: these, and many like questions, which cannot at present be answered, seem to be evidence enough that, in the making of epidemics, contagion and personal susceptibility may be factors in a partly *conditional* sense. Influences which are called "atmospheric"—the various

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direct and indirect influences which attach to the normal succession and occasional abnormality of seasons, in respect of the insolation of our planet, and of the temperature and humidity of air and earth—are in general far too vaguely regarded as elements of interest in the present question, but are possible factors which no epidemiologist should omit from scientific consideration. For any definite knowledge which exists on the relation of particular conditions of season to the prevalence of particular epidemics, the reader is referred to the article EPIDEMICS, and to articles on the respective diseases.

In the PASSAGE of the metabolic contagia FROM PERSON TO PERSON various agencies may be instrumental,—bedding or clothing or towels which have been used by the sick, dirty hands, dirty instruments or other utensils, the washerwoman's basket, foul water-supply, stinking house-drains, contaminated milk or other food, the common atmosphere, &c.; but differences of that sort are only differences as to the *means by which such communication is established with a diseased body* as brings its products into relation with healthy persons; and the disengagement of *infectious products* from the bodies of the sick is pathologically the one influential fact. As regards the products which ought to be deemed infectious, the specially-diseased surfaces and organs of the patient, and the discharges and exhalations which they respectively yield, must always be regarded with chief suspicion; but suspicion, however much it may insist on them, must never disregard other sources of danger. Of some of the metabolic contagia we practically know, and of many of the others we may by analogy feel sure, that, when a given body is possessed by one of them, no product of that body can be warranted as safe not to convey the infection. Presumption against every part and product of the diseased body is by everyone readily admitted where there are vehement general symptoms of disease: but it is important to know that not only in such febrile states, but even in states of chronic dyscrasy and even at times when the dyscrasy may be giving no outward sign, the infected body may be variously infective. Thus, in

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regard to constitutional syphilis, it is certain that the mere utero-catarrhal discharge of the syphilitic woman, or the sperm of the syphilitic man, or the vaccine lymph of the syphilitic infant, may possibly contain the syphilitic contagium in full vigour, even at moments when the patient, who thus shows himself infective, has not on his own person any outward activity of syphilis. Similarly, in regard to tubercular disease, experiment has proved beyond question that the milk of animals suffering from tubercle will, if taken as food by other animals, infect them through the intestinal mucous membrane: and there are independent reasons for believing that the tubercular contagium (like the syphilitic) will at times during the dyscrasy be contained in the seminal fluid, and that men, tubercular perhaps only in some degree which is not immediately important to themselves, may by that secretion convey fatal infection to women with whom they have conjugal relations.* Regarding many of the metabolic contagia, conclusive evidence exists that, when they are in operation in pregnant women, the fœtus will in general be infected by them; and this though the diseases (*e.g.* small-pox, cholera, syphilis) be of the most different pathological types: but with regard to pregnant animals affected with splenic fever it is noticeable that Brauell, in his extensive researches, found the blood of the fœtus not to be infective.

In general, each contagium has its own favourite WAY OR WAYS OF ENTERING THE BODY; and these preferences are not only of speculative interest, as attaching to varieties of nature and natural habits among the contagia, but are of obvious practical importance as measures of the widely different degrees in which the different contagia are qualified to spread in communities. Thus, *inoculation at broken surfaces* of skin or mucous membrane has long been known as the ordinary mode by which the infections of syphilis, hydrophobia, splenic fever, cow-pox, and farcy or glanders, get admission to the body; and our best knowledge of some other infectious diseases (notably of tubercle) has been derived from inoculations intentionally made with their

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* See Dr. Weber, in *Clin. Soc. Trans.*, 1874.—J.S.

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contagia for purposes of study. While probably all infections which tend to be of general action on the body can be brought into action in that way, and while some infections are not known to pass by any other mode of transmission, there are many infections which spread freely from subject to subject by *atmospheric and dietetic communication*; and the meaning of these preferences is hitherto not fully known. It seems that some contagia are so acted upon by air and water, that they seldom or never reach the body in an effective state by those common means of communication,—some hardly, if at all, by water, and some not by air except with very close intercourse; and further, that, of contagia which reach the body in an effective state, some require, while others do not require, that an abnormal breach of surface shall give them special opportunity for taking hold. In some of the cases where a disease can be propagated in both ways,—*i.e.*, certainly in small-pox, and apparently also in bovine pleuro-pneumonia, the artificially-inoculated disease tends to be much milder than the disease otherwise contracted; but pathologicially it is difficult to conceive any essential difference between those different modes of contagion. It may be presumed that, in the modes which are not by true inoculation, acts which are comparable to inoculation take place on internal surfaces; that, for instance, when particles of scarlatina-contagium are caught in the tonsils, or inhaled into the bronchi, or swallowed into the stomach, they begin by penetrating the texture of the mucous membrane, and by thus effecting as real an inoculation, with regard to the blood, as that which art or accident provides in other cases through the punctured skin. That previous abnormal breach of surface by artificial puncture or otherwise is not necessary to allow the infection of mucous surfaces is illustrated in ophthalmia and gonorrhœa; where apparently no other condition has to be fulfilled than that a particle of the blennorrhagic contagium shall be deposited on the natural surface of the mucous membrane. It deserves notice that, while a considerable number of the worst diseases of the domestic animals admit of being communicated to man by artificial inoculation, atmospheric communication seems to be very

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inapt, if not absolutely unable, to infect man with any one of them; and in this connexion it may be of interest to remember that syphilis, one of the most familiar of human infections, but hitherto not traced to any brute ancestry, differs from our other current infections in requiring inoculation to transmit it.

When any metabolic contagium enters the animal body, it requires an INTERVAL OF TIME, and in most cases a considerable interval, before its morbific effects can become manifest even to skilled observation. The period of latency or so-called INCUBATION varies greatly in different cases. In hydrophobia it is very rarely less than of one month, is certainly often of several months, and is said to be sometimes of years. In syphilis the inoculated spot remains generally for at least a fortnight, and may remain even as much as five weeks, without any ostensible change; and the roseola of the general infection will not be seen till some weeks later, when generally at least three months will have elapsed since the first inoculation. In the acute eruptive fevers, when their contagium is transmitted by air, the first changes which ensue on infection are not external, and we cannot be sure what early internal changes may take place; but in small-pox, the fever (which is the first overt sign) does not attract notice till about the twelfth day after infection, nor the eruption till two days later; and in measles the incubation-time, though perhaps less uniform, seems to be little (if any) shorter than that of small-pox. The septic contagia and the contagium of splenic fever seem to be of particularly quick operation; but even the most virulent septic contagium, when without admixtures which tend to complicate its action, will not begin sensibly to derange the infected animal till at least several hours after it has been inoculated. As regards the contagia last referred to, it is conceivable that the self-multiplication of the contagium in the form in which it proves fatal to life is a process which goes on continuously and uniformly from the moment of inoculation to the moment of death, and that the moment when signs of general derangement become manifest is the moment when this uniformly-advancing process has accumulated in the system a certain quantity of result:—but it

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does not seem easy to apply this explanation to the diseases of long incubatory period; and we can hardly conjecture what may be the latent processes—for instance of small-pox, during the first ten or more days after contagium has been received.

It is not yet possible to say, in any universal sense, with regard to the metabolic contagia, what is the ESSENTIAL CONSTITUTION of "contagious matter," or what the INTIMATE NATURE of the "transforming power" which the particle of such matter exercises on the particles which it infects. —As regards the question of the FORCE, chemists, when they refer in general terms to the various acts which they designate *acts of fermentation*, allege that certain processes of change in certain sorts of organic matter induce characteristic changes in certain other sorts of organic matter, not by the common chemical way of double decomposition with reciprocally new combinations, but (so to speak) as a mere by-play, or collateral vibration-effect, of the chemical force which is in movement; and though language can hardly be more vague than this for any scientific purpose, it expresses clearly enough the conviction of experts that a certain great force in nature lies beyond their power even of definite nomenclature, much more of exact identification and measurement. In that most interesting, but most difficult and hitherto almost uninvestigated, branch of chemical dynamics, we are supposed to have our nearest clue to the scientific problems of the present subject-matter. It may be conceded that the "contact-influences" which are dimly recognised as causing the fermentatory changes of dead organic matter have apparent analogues in many of the morbific influences of contagion: for the changes which chemists call "fermentatory" are all catalytic or disintegrative of the organic compounds which they affect; and when living protoplasm is brought by contagion into processes of *characteristic decay*, the analogy seems sufficiently close to justify the word *zymotic* in the naming of the nature of the process. But it must not be forgotten that, among immediate effects of contagion in the living body, are cases wherein the process (so far as we can yet see) is primarily not *catalytic* or *dis*-integrative, but, on the contrary, *ana-*

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plastic or *con*-structive. Thus, when tubercle gives rise to tubercle, whether by secondary and tertiary infection in a single diseased body, or by infection from the sick to the healthy, each new tubercle which the contagion brings into being is a *growth-product* of the texture which bears it. And similarly, when the innumerable varieties of cancerous tumour propagate themseles by contagion, each after its special type, in the bodies of the respective sufferers, it is growth, not disintegration, which we first see. It would seem that in those cases of anaplastic "contact-influence" something far beyond the analogy of chemical fermentations must be involved; and, in view of some of them, the physiologist has to bethink himself of the analogy of that "contact-influence" which becomes the mainspring of all normal growth and development, when the ovum receives spermatic impregnation.—As regards the ultimate ORGANIC CONSTITUTION of the several metabolic contagia—(each of them of course abstracted from accidental admixtures, and seen or conceived in the smallest and simplest units of quantity and quality in which its specific force can be embodied)—modern research seems more and more tending to show that the true unit of each metabolic contagium must either be, or must essentially include, a *specific living organism, able to multiply its kind.* For with regard to those other contagia (as we may properly call them) which spread fermentatory processes in common external nature, and of which it is as clear as of the morbific contagia that they multiply themselves in proportion as they act, it seems to be established beyond reasonable doubt that the "self-multiplication" of each of them as it acts is the infinite multiplication of a specific microphyte; and that this microphyte (acting apparently by means of a matter which it produces and from which it can be mechanically separated) is the essential originator of the fermentation.* This being

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* The doctrine to which the words in parenthesis refer (that the microphyte is not itself the ferment, but the producer and evolver of the ferment) tends to bring the case of these ferments into parallelism with that of the chylopöetic and other functional ferments which more highly organised creatures produce for the purposes of their own economy. In the latter case the distinction between the ferment-yielding live bodies (say certain gastric cells) and their not-live product (say pepsin) is already familiar.—J.S.

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the case in regard of those fermentations, it seems probable that the same is in substance true of the specific morbid changes which extrinsic contagia produce in the materials of the living body: probable, namely, that low, self-multiplying organic forms, specific in each case for the particular disease which is in question, are essential to each morbid poison; that the increase of each contagium as it acts is the characteristic self-multiplication of a *living thing;* and that *this* (however obscure may yet remain its mode of operation) is the *essential originator of change* in the affected materials of the diseased body. The fact that low organic forms of the sorts now spoken of have often, or generally, been seen in the morbid products and tissues of persons with zymotic disease, would not by itself be a proof, or nearly a proof, that the forms are causative of the morbid change: for obviously they might be mere attendants on the necrosis and decomposition of bodily material, availing themselves of the process (just as certain insects would) to feed and multiply: and in many of the cases in which micrococci have been seen in morbid material, no direct proof could be given that the meaning of their presence was more than that. There are, however, some cases in which this proof has been completely established; and though such cases are at present but few, the significance of each of them in aid of the interpretation of other cases is of the highest importance. The researches of successive able observers in regard of the splenic fever of farm-stock, and those of Dr. Klein in regard of the "pneumo-enteritis" (as he names it) of swine, have shown that in each of these cases the microphyte which attends the disease is botanically specific; that it and its progeny can be conducted through a series of artificial cultivations apart from the animal body; and that germs thus remotely descended from a first contagium will, if living animals be inoculated with them, breed in these animals the specific disease. It is equally well known that the organism (spirilla) which is found multiplying in the blood during the accesses of relapsing fever, is botanically specific; but in regard to this disease (which is not known to affect any other animal than man) experimental proof is

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still wanting that the microphyte, after long artificial cultivation, will be able to infect with the disease. Studies as complete as those which have been made in splenic fever and pneumo-enteritis will no doubt sooner or later be made in regard to many other of the diseases, but their progress will necessarily be slow; partly because the objects which have to be scrutinised, and to which specific characters have to be assigned, are so extremely minute, and often so similar among themselves, that none but very skilled and very patient microscopical observers are competent to pronounce on them; and partly again because the conditions of the case are such as to limit very closely the field within which the essential experimental observations can be made. Meanwhile, however, the two diseases, regarding which the larger knowledge has been obtained, must be regarded as highly suggestive in regard of other diseases of the same pathological group, and particularly as giving importance to fragments of evidence (not by themselves conclusive) which have been gathered of late years in studies of some of these other diseases. Eminently this is true of the large family of the septic infections—including on the one hand erysipelas and pyæmia with its congeners, and having on the other hand tuberculosis intimately associated with it; and almost equally it is true of enteric fever and cholera and diphtheria, and of the small-pox of man and beast. Thus, though it would be at least premature to say of these diseases that they certainly have as their contagia *microphytes respectively specific* to them, it seems at present not too much to say that probably such will be found the case; and if as much may not yet be said of many other diseases which are due to metabolic contagia, it must be remembered that the right lines of study relating to contagia in this point of view have not till within very recent times been opened.

Of the NATURAL HISTORY of the contagia, considered independently of the part which they play in the living body, there are hitherto only the beginnings of knowledge. The absolutely first origin of contagia may perhaps not be more within reach of scientific research than the absolutely first origin of dog or cat; but their nearer antecedents—the states

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out of which they come when first about to act on the living body, and generally the variations which they and the common ferments exhibit under natural and artificial changes of circumstance, are within easy reach of investigation; and those humbler studies are likely to give very useful results. For some of our cases we seem to have an instructive analogy in the facts which Professor Mosler has put together in explanation of the blue-milk contagium of dairies: facts showing that the omnipresent penicillium glaucum, if its spores happen to alight in particular (morbid) sorts of milk, will operate distinctively on their casein as an anilin-making ferment, rendering the milk blue and poisonous, and imparting to each drop of it the power to infect with a like zymosis any normal milk to which it may be added.* In our own more special field, pathologists have already learnt that certain of the so-called "morbid poisons"—the contagia of erysipelas, pyæmia and tuberculosis, are intimately related to the common ferment or ferments of *putrefaction;* and that the most vehement of these contagia can be developed by the artificial culture of successive transmissions in the living body from the comparatively mild contagium of any *common inflammatory* process.†

Two other directions suggest themselves as likely to lead to fields of useful observation and experiment. On the one hand, in *comparative pathology*, and with the tracing of contagion from animal to animal, there is the possibility that at last some lower and relatively worthless order of animals may be found the starting-ground of fatal infections for higher orders; and this, perhaps, by contagia which in their former relations are of mere inflammatory significance. On the other hand, in *geographical pathology*, and with the tracing of contagion from place to place, local centres of contagium-origination may possibly be found, in which the

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* Virch. *Arch.*, vol. 43.—J.S.

† See particularly Professor Sanderson's papers in successive yearly volumes of *Reports of the Medical Officer of the Privy Council* from 1868 to 1877. It concerns the second fact mentioned in the text to remember that apparently every "common inflammatory process" includes more or less of textural changes which are necrotic and of septic tendency. See *Holmes's System of Surgery*, first edition, article "Inflammation."—J.S.

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contagium, before it enters the animal body, will show itself an independent microphyte of the earth, first operating on the animal body as the essential force in a local malaria. Some of the worst pestilences known to the human race—yellow fever, cholera, perhaps plague, and also some of the diseases of cattle, have in their history facts which suggest that sort of interpretation: the supposition, namely, that certain microphytes are capable of thriving equally (though perhaps in different forms) either without or within the animal body; now fructifying in soil or water of appropriate quality, and now the self-multiplying contagium of a bodily disease. In regard to our own common ague-poison there seems every reason to suspect that its relation to soil is that of a microphyte; and though we know ague only as practically a non-contagious disease, we do not know that any little transfusion of blood from sick to healthy would not show it to be (in that way) communicable from person to person.

It needs hardly be said that exact scientific knowledge of the contagia, and of their respective modes of operation, is of supreme importance to the PREVENTION OF DISEASE. With even such knowledge of them as already exists, diseases which have in past times been most murderous of mankind and the domestic animals can, if the knowledge be duly applied, be kept comparatively, or absolutely, in subjection; and the fact that at the present time fully a fifth part of the annual mortality of the population of England is due to epidemics of contagious disease is only because of the very imperfect application hitherto made of that knowledge. In the present article it is not necessary to state in detail the practice which ought to be adopted in the various different cases of infectious disease; but briefly it may be said that one principle is at the root of all such practice, whatever the disease to which it relates. This principle, which of course becomes more and more important in proportion as the infection is dangerous, and as the persons whom it would endanger are many, is the principle of *thoroughly effective separation* between the sick and the healthy: a separation, which, so far as the nature of the disease requires, must regard not only the personal

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presence of the sick, but equally all the various ways, direct and indirect, by which infective matters from that presence may pass into operation on others. Especially as regards the diseases which make serious epidemics, the principle of isolation is not carried into effect unless due care be taken to thoroughly disinfect in detail all infective discharges from the sick, and all clothing and bedding and towels and like things which such discharges may have imbued, and finally, as regards certain contagia, the rooms in which the cases have been treated; and in order to secure these objects, it is essential in all grave cases to make such nursing-arrangements and such arrangements of the sick-room (whether private or in hospital) that no retention or dissemination of infectious matters will escape notice. It is likewise essential that all who attend on the sick should be careful not to carry contagion to other persons; as they may but too easily do, particularly in scarlatina and in certain traumatic and puerperal infections, if they omit to take special precautions against the danger. *See* articles QUARANTINE, DISINFECTION, and PUBLIC HEALTH, and those on the special diseases.

The SOCIAL CONDITIONS through which, in our own country at the present time, the more fatal infectious diseases are enabled to acquire *epidemic diffusion* are chiefly such as the following:—that persons first sick in families and districts, instead of being isolated from the healthy, and treated with special regard to their powers of spreading infection, are often left to take their chance in all such respects; so that, especially in poor neighbourhoods, where houses are often in several holdings, and where always there is much intermingling of population, a first case, if not at once removed to a special establishment, will almost of necessity give occasion to many other cases to follow;—that persons with infectious disease, especially in cases of slight or incipient attack, and of incomplete recovery, mingle freely with others in work-places and amusement-places of common resort, and, if children, especially in day-schools; and that such persons travel freely with other persons from place to place in public conveyances;—that often, on occasions when boarding-schools have infectious

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disease getting the ascendant in them, the schools are broken up for the time, and scholars, incubating or perhaps beginning to show infection, are sent away to their respective, perhaps distant, homes ;—that keepers of lodging-houses often receive lodgers into rooms and beds which have recently been occupied by persons with infectious disease and have not been disinfected ;—that persons in various branches of business relating to dress (male and female) and to furniture, if they happen to have infectious disease, such as scarlatina or small-pox, on their premises, probably often spread infection to their customers by previous carelessness as to the articles which they send home to them ; and that laundries further illustrate this sort of danger by carelessness in regard to infected things which they receive to wash ;—that purveyors of certain sorts of food, if they happen to have infectious disease on their premises, by carelessness spread infection to their customers ; —that streams and wells with sewage and other filth escaping into them are most dangerous means of infection, especially as regards enteric fever and cholera ; and that great purveyors of public water-supplies, so far as they use insufficient precautions to ensure the freedom of their water from such risks of infectious pollution, represent in this respect an enormous public danger ;—that ill-conditioned sewers and house-drains, and cesspools receiving infectious matters, greatly contribute to disseminate contagia, often into houses in the same system of drainage, and often by leakage into wells. Of the dangers here enumerated, there is perhaps none against which the law of England does not purport in some degree to provide. At present, however, they all are, to an immense extent, left in uncontrolled operation ; partly because the law is inadequate, and partly because local administrators of the law often give little care to the matter ; but chiefly because that strong influence of national opinion which controls both law and administration cannot really be effective until the time when right knowledge of the subject shall be generally distributed among the people, and when the masses whom epidemics affect shall appreciate their own great interest in preventing them.

Whenever that time shall come, probably the public good will be seen to require, with regard to every serious infectious

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disease which is apt to become epidemic, that the PRINCIPLES which ought to be accepted in a really practical sense, and to be embodied in effective LAW, are somewhat as follows:—(1) that each case of such disease is a public danger, against which the public, as represented by its local sanitary authorities, is entitled to be warned by proper information; (2) that every man who in his own person, or in that of anyone under his charge, is the subject of such disease, or is in control of circumstances relating to it, is, in common duty towards his neighbours, bound to take every care which he can against the spreading of the infection; that so far as he would not of his own accord do this duty, his neighbours ought to have ample and ready means of compelling him; and that he should be responsible for giving to the local sanitary authority proper notification of his case, in order that the authority may, as far as needful, satisfy itself as to the sufficiency of his precautions; (3) that so far as he may from ignorance not understand the scope of his precautionary duties, or may from poverty or other circumstances be unable to fulfil them, the common interest is to give him liberally out of the common stock such guidance and such effectual help as may be wanting; (4) that so far as he is voluntarily in default of his duty, he should not only be punishable by penalty as for an act of nuisance, but should be liable to pay pecuniary damages for whatever harm he occasions to others; (5) that the various commercial undertakings which in certain contingencies may be specially instrumental in the spreading of infection—water-companies, dairies, laundries, boarding-schools, lodging-houses, inns, &c., should respectively be subject to special rule and visitation in regard of the special dangers which they may occasion; and that the persons in authority in them should be held to strict account for whatever injury may be caused through neglect of rule; (6) finally, that every local sanitary authority should always have at command, for the use of its district, such hospital-accommodation for the sick, such means for their conveyance, such mortuary, such disinfection-establishment, and generally such planned arrangements and skilled service, as may, in case of need, suffice for all probable requirements of the district.

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Persons who are imperfectly acquainted with the scientific and social facts relating to the present subject-matter, or who have never seriously considered them, may think it would be over-sanguine to expect any general recognition of principles so peremptory as the above may at first appear to them; but, if so thinking, they would perhaps have under-estimated the rapidity with which knowledge is now increasing as to the common interests and mutual duties of mankind in respect of dangerous infectious disease. Fourteen years ago, when the so-called cattle-plague or steppe-murrain was imported afresh, as a long-forgotten disease, into this country, and was found to affect very large pecuniary interests, primarily of the chief land-owners of the United Kingdom, and secondarily also of other classes, an immensely valuable stimulus was given to the education of the country, and especially of its Legislature, in regard to the preventability of the infectious diseases. And the remarkable zeal and ability which have been shown, in providing adequate laws and admirable administrative arrangements against the diffusion of steppe-murrain and other infectious diseases of Farm-Stock, are not likely to be found permanently absent in relation to the interests of Human Life, when once the true bearings of the subject got to be popularly understood.

EXPERIMENT AS A BASIS OF PREVENTIVE MEDICINE.

[The following address given by Mr. Simon at the International Medical Congress in 1881, five years after his retirement from office, is naturally connected with the subjects of the immediately preceding reports, and forms a suitable conclusion to the series of reports which are reprinted in these volumes.—Ed.]

EXPERIMENT AS A BASIS OF PREVENTIVE MEDICINE.

EXPERIMENTS ON LIFE, AS FUNDAMENTAL TO THE SCIENCE OF PREVENTIVE MEDICINE, AND AS OF QUESTION BETWEEN MAN AND BRUTE.

An Address delivered on August 3rd, 1881, *at the Opening of the State-Medicine Section of the International Medical Congress then assembled in London: By* John Simon, C.B., *President of the Section.*

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Gentlemen,—In considering what should be my first words in the position which I have the honour to occupy, I fortunately recollect a word of ancient wisdom: "What shall the man "say who cometh after a king?" Already to-day the Chrysostoms of our English branch of the Medical Profession have, with their usual felicity, expressed, on behalf of all of us, the feelings which all must equally entertain on occasion of so great a meeting of our professional brotherhood. I therefore need not, on behalf of the officers of this Section, say more than one word of cordial friendship and congratulation and welcome to those whom we have the pleasure and honour of seeing here: whether they come from within the limits of this United Kingdom of Great Britain and Ireland, or be our fellow-labourers from other lands. If I may add a word specially for myself, I would beg to say how peculiarly gratified I am to know that there will sit on the benches of this Section many of those workers and masters of our craft from whom it has long been my own daily privilege to learn.

My colleagues in the provisional service of this Section, and persons of authority in the general management of the Congress, have pressed on me their wish that I should occupy part of this half-holiday afternoon by addressing to you some

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general talk in relation to the subject-matter of our Section. I may confess myself to have believed, till almost the last moment, that my best presidential contribution to our meetings would be to sit as a respectful listener; but, on the other hand, I should so much regret to appear merely indolent in regard of what has been desired of me, that, on that ground, though reluctantly, and with unaffected apologies for what I fear may prove a tedious occupation of your time, I defer to the wishes which have been expressed.

Assuming that the members of the Section would not expect anything new in what I might say, I have speculated whether, perhaps, in directions which are not new, I might say anything which would suggest useful thought to outsiders interested in our proceedings. I have remembered that, in our Section of the Congress, we may peculiarly take for granted that the general public overhears what we say. Many of our matters of debate are matters of immense public concern; and the arguments relating to them are in many parts such as the laity can follow equally with ourselves. It has struck me that, as your President on this occasion, I may perhaps usefully have regard to that consideration. Chiefly, then, in that point of view, and with intentions which I hope may explain themselves as I go on, I shall offer you some remarks on certain of the scientific relations of State-Medicine. I trust that the thoughts and convictions which I shall express will be fully as much yours as my own, and will thus be far more deserving of public attention than if I pretended to call them original; and, indeed, as regards one practical purpose which I have in view, there is nothing I would so much desire as that I may be deemed merely your mouthpiece or interpreter.

First: a few words on what may be called the general theory of our subject-matter. The term "State-Medicine" corresponds to the supposition that, in certain cases, the Body-Politic will concern itself with the health-interests of the people—will act, or command, or deliberate, or inquire, with a view to the cure or the prevention of disease. Before any such supposition can be effectively realized, the *Science* of Medicine—that is to say, the *exact knowledge* of means by

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which disease may be prevented or cured, must have reached a certain stage of development; and, unless the science be supposed common to all persons in the State, the existence of State-Medicine supposes a special class of persons whom the unskilled general public can identify as presumably possessing the required knowledge. Thus, given the class of experts to supply the required exact knowledge, the Body-Politic undertakes that, within the limits of its own constitutional analogies, it will make the knowledge useful to the community.

I have intimated that in State-Medicine (just as in private medicine) the medical function may be exercised either in *curing* or in *preventing* disease; but practically these two departments of State-Medicine are not of equal magnitude, nor are dealt with in quite the same spirit.

As regards *Curative* Medicine, modern governments have in general found it needless to interfere in much detail in favour of persons who require medical treatment. It is true that for cases which may be deemed exceptional—the case of the destitute poor, and the case of districts under grave pestilential visitation, modern governments seem universally to acknowledge that it is their duty to provide, at the public charge, such medical skill and such appliances as may be needed; but, apart from those exceptions, the only action which the State takes in regard of curative medicine is that which consists in its authentication of a skilled Medical Profession, and in the distinction which it sees fit to draw, as regards rights and privileges, between those who have been duly declared competent to treat disease, and those who have not been so declared.

Larger and far more various than the action taken by the State with reference to the cure of disease, is that which it takes in regard of prevention; and it is particularly of *Preventive State-Medicine* that I propose to speak. In its legal aspect, it is represented by a considerable mass of statutes (nearly all of them enacted within the last thirty-five years) and by an army of administrative authorities and officers appointed to give effect to those enactments. I need not describe in detail the laws and administrative machinery to

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which I refer, but I may remind you of the largeness and variety of their scope, even by quoting only the terms in which I was able, twelve years ago, to speak of the public health law of England: "It would, I think, be difficult to " over-estimate, in one most important point of view, the pro- " gress which, during the last few years, has been made in " sanitary legislation. The principles now affirmed in our " statute-book are such as, if carried into full effect, would " soon reduce to quite an insignificant amount our present " very large proportions of preventable disease. It is the " almost completely expressed intention of our law that all " such states of property, and all such modes of personal " action or inaction, as may be of danger to the public health, " should be brought within scope of summary procedure " and prevention. Large powers have been given to local " authorities, and obligation expressly imposed on them, as " regards their respective districts to suppress all kinds of " nuisance, and to provide all such works and establishments " as the public health primarily requires; while auxiliary " powers have been given, for more or less optional exercise, " in matters deemed of less than primary importance to health; " as for baths and wash-houses, common lodging-houses, " labourers' lodging-houses, recreation-grounds, disinfection- " places, hospitals, dead-houses, burial-grounds, &c. And in " the interests of health, the State has not only, as above, " limited the freedom of persons and property in certain " common respects; it has also intervened in many special " relations. It has interfered between parent and child, not " only in imposing limitation on industrial uses of children, " but also to the extent of requiring that children shall not be " left unvaccinated. It has interfered between employer and " employed, to the extent of insisting, in the interest of the " latter, that certain sanitary claims shall be fulfilled in all " places of industrial occupation. It has interfered between " vendor and purchaser; has put restrictions on the sale and " purchase of poisons; has prohibited in certain cases certain " commercial supplies of water; and has made it a public " offence to sell adulterated food or drink or medicine, or to " offer for sale any meat unfit for human food. . . . . Its care

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"for the treatment of disease has not been unconditionally "limited to treating at the public expense such sickness as "may accompany destitution; it has provided that, in any "sort of epidemic emergency, organized medical assistance, not "peculiarly for paupers, may be required of local authorities; "and, in the same spirit, it requires that vaccination at the "public cost shall be given gratuitously to every claimant. "The above survey might easily be extended by referring to "statutes which are only of partial or indirect or subordinate "interest to human health; but, such as it is, it shows beyond "question that the Legislature regards the health of the "people as an interest not less national than personal, and has "intended to guard it with all practicable securities against "trespasses, casualties, neglects, and frauds."* At the time when that description was written, I unfortunately had to confess that the intentions of the Legislature were not carried into effect; for that the then existing laws (especially in respect of the local authorities which should give effect to them) were in a state of almost chaotic confusion and unworkability; but, since that time, an entirely new constitution of local authorities has been made, some thousands of additional officers have been appointed, and the general fabric of the law has been consolidated, and its powers in some respects extended and made more stringent, with a view to the better prevention of disease so far as legal powers and facilities can attain that object.

Such being the very large contribution which the *Body-Politic* makes to the purposes of Preventive State-Medicine in this country, let us next see how we of the *Medical Profession* stand, in respect of the scientific contribution which we distinctively owe to the same great object. In preventive, just as in curative medicine, it occasionally happens that consequences, more or less valuable, result from some mere chance-hit of discovery; but except so far as this may sometimes (and but very rarely) happen, disease can only be prevented by those who have knowledge of its CAUSES—knowledge,

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* Eleventh Report of the Medical Officer of the Privy Council, 1869.

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which does not deserve to be called knowledge, unless in proportion as it is *conclusive and exact;* and thoroughly to investigate the causes and their mode of operation is the quite indispensable first step towards any scientific study of prevention. Essentially, we know how to prevent by having first learnt exactly how to cause. Therefore it is that preventive medicine has had almost no development until within these later times. The germinal thought of it may be traced in even the first days of our profession. The spirit, in regard of which Hippocrates has been aptly called the Father of Medicine—the scientific spirit of observation and experiment, as distinguished from the spirit of priestcraft, was one which his medical writings equally showed in their preventive as in their curative relations; and when he, some twenty-three centuries ago, expounded to his contemporaries that pathology is a branch of the Science of Nature—that causes of disease are to be found in physical accidents of air and earth and water, and in quantities and qualities of food, and in personal habits of life, he (not without risk of being denounced for impiety) virtually proclaimed for all time the first principle of preventive medicine, and indicated to his followers a new line of departure for those who would most largely benefit mankind. His followers, however, have had their work to do. True knowledge of morbific causes could only come by very slow degrees, and as part of the development with which the physical and biological sciences have, little by little, with the labour of ages, been building themselves up; and so, no wonder that, despite the lapse of time, even the most advanced of nations are hitherto but beginning to take true measure of the help which preventive medicine can render them.

Now, what is the nature of that *Study of Causes* through which we may gradually arrive at counter-causing or preventing? Addressing a skilled audience, I shall utter what to them is the merest commonplace when I say that, in the physical and biological sciences, we acknowledge no other study of causes than that which consists in EXPERIMENT. The study of morbific causes is no exception to that rule. It is solely by means of EXPERIMENT that we can hope so to learn the causes of disease as to become possessed of resources for preventing disease.

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The experiments which give us our teaching with regard to the causes of disease are of two sorts: on the one hand we have the carefully pre-arranged and comparatively few experiments which are done by us in our *Pathological Laboratories*, and for the most part on *other animals than man ;* on the other hand, we have the experiments which *Accident* does for us, and, above all, the incalculably large amount of crude experiment which is *popularly done by man on man* under our present ordinary conditions of social life, and which gives us its results for our interpretation.

When I say that experiments of those two sorts are the sources from which we learn to know the causes of disease, I, of course, do not mean that the mental process by which an experiment becomes instructive to us is the same in regard of the two sorts of experiment. On the contrary, the ætiological problem (so long as it is a problem) is approached in the two cases from two opposite points of view ; and the dynamical continuity of relation, which we call cause-and-effect, is traced, in the one case from the one pole, and in the other case from the other pole, of the relation. In the one case, starting with knowledge of our own deliberately prepared *cause*, our question is, what will be its effect? In the other case, starting from a certain *effect* presented to us, our question is, what has been its cause? But in the second case, just as in the first, when the question is answered, when the problem is solved, when the relation of cause and effect has been made clear, we recognize that the conjuring-power which has brought us our new knowledge is the power of a *performed experiment.*

Let me illustrate my argument by showing you the two processes at work in identical provinces of subject-matter.—What are the classical experiments to which we chiefly refer when we think of guarding against the dangers of Asiatic cholera? On the one side there are the well-known *scientific* infection-experiments of Professor Thiersch, performed on a certain number of mice. On the other hand, there are the equally well-known *popular* experiments which, during our

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two cholera epidemics of 1848–9 and 1853–4 were performed on half a million of human beings, dwelling in the southern districts of London, by certain commercial companies which supplied those districts with water. Both the professor and the water-companies gave us valuable experimental teaching as to the manner in which cholera is spread. [See, at end of Address, the appended Note A.] I need not now state at length the facts of those experiments, probably known to all here, but may rather justify my parallel by referring to a different ætiological question which will be presently discussed in our section. It concerns the *causation of tubercle*—the most fatal by far of all the diseases to which the population of this country is subject. On that subject, for the last sixteen years, we have had a new era of knowledge. It was the great merit of a Frenchman, M. Villemin, that he, in 1865, first made us fully aware that tubercle is an infectious disease. He did this by certain *laboratory experiments* performed on other animals than man. He found that general and fatal tubercular infection of the animal was produced when he inoculated it subcutaneously with a little crude tubercular matter from the human subject. That first laboratory investigation of the subject has been followed most extensively by others; and the further experiments, while entirely confirming M. Villemin's discovery, have shown that subcutaneous inoculation is not the only mode by which the tubercular infection can be propagated. Dr. Tappeiner and others have shown that the same effect is produced on the animal if tubercular matter (such as the sputa of phthisical patients) be diffused in spray in the air which the animal breathes; and Professor Gerlach, of Hanover, showed, twelve years ago, with regard to the bovine variety of tubercular disease (the *Perlsucht* of the Germans) that its infection can be freely introduced through the stomach if bits of tubercular organs be given in the food, or if the healthy animal be fed with milk from the animal which has tubercle. That the communicability of tubercle from animal to animal is also being tested to an immense extent by *popular experiments* on the human subject, is what a moment's reflection will tell; and from that wide field of experiment I select one instance for illustration.

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I have every reason to believe that Professor Gerlach's experiments on the communicability of tubercle by means of milk are very extensively parodied by commercial experiments on the human subject. I learn, on what I believe to be the highest authority in this country, that tubercle (in different degrees) is a malady which abounds among our cows; and that so long as the cow continues to give milk, no particular scruple seems to prevent a distribution of that milk for popular use. To the persons who consume that milk, an important question as to the causability of tubercle is put in an experimental form. Whether they will become infected with tubercle, is a question which the individual consumers do not stand forward to answer for themselves, like the animals of the laboratory experiments: but Dr. Creighton's lately published book, entitled, "Bovine Tuberculosis in Man," and a paper in which I am glad to say he brings under notice of our Section the very remarkable series of facts on which he grounds that startling title, seem to suggest a first instalment of answer in accordance with Professor Gerlach's experimental finding.

The two sorts of experiment—the scientific and the popular—differ, as I have noted, in this particular: that the popular experiment is almost always done on man; the scientific almost always on some other animal. It is true that many memorable cases are on record, where members of our profession have deliberately given up their own persons to be experimented on by themselves or others for the better settlement of some question as to a process of disease; have deliberately tried, for instance, whether, in this way or in that, they could infect themselves with the poison of plague or of cholera; and, as regards one such case which is in my mind, I think it not unlikely that the illustrious life of John Hunter was shortened by the experiments which he did on himself with the ignoble poison of syphilis. There have been cases, too, where criminals have been allowed to purchase exemption from capital or other punishment at the cost of allowing some painful or dangerous experiment to be performed on themselves. And cases are not absolutely unknown where unconsenting human beings have been subjected to that

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sort of experiment. But, waiving such exceptions, the rule is, as I have said, that scientific experiments relating to causes of disease are performed on some animal which common opinion estimates as of lower importance than man. Now, as between man and brute, I would not wish to draw any distinction which persons outside this room might find invidious; but, assuming for the moment that man and brute are of exactly equal value, I would submit that, when the life of either man or brute is to be made merely instrumental to the establishment of a scientific truth, the use of the life should be economical. Let me, in that point of view, invite you to compare, or rather to contrast with one another, those two sorts of experiment from which we have to get our knowledge of the causes of disease. The commercial experiments which illustrated the dangerousness of sewage-polluted water-supplies cost many thousands of human lives; the scientific experiments which, with infinitely more exactitude, justified a presumption of dangerousness, cost the lives of fourteen mice. [See Note A.] So, again, with experiments as to the causation of tubercle:—judging from the information which I quoted to you, I should suppose that the human beings whose milk-supply on any given day includes milk from tubercular cows might be counted, in this country, in tens of thousands; but the scientific experiments which justify us in declaring such milk-supply to be highly dangerous to those who receive it were conclusive when they amounted to half a dozen. So far, then, as regards the mere getting of experimental knowledge, we must not, with a view to economy of life, be referred to popular, rather than scientific, experiment. And in the same point of view, it perhaps also deserves consideration that the popular experiments, though done on so large a scale, very often have in them sources of ambiguity which lessen their usefulness for teaching.

Let me now briefly refer to the fact that, during the last quarter of a century, all practical medicine (curative as well as preventive) has been undergoing a process of transfiguration under the influence of laboratory-experiments on living things. The progress which has been made from conditions of vague-

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ness to conditions of exactitude has, in many respects, been greater in these twenty-five years than in the twenty-five centuries which preceded them; and with this increase of insight, due almost entirely to scientific experiment, the practical resources of our art, for present and future good to the world, have had, or will have, commensurate increase. Especially in those parts of pathology which make the foundation of preventive medicine, scientific experiment in these years has been opening larger and larger vistas of hope; and more and more clearly, as year succeeds year, we see that the time in which we are is fuller of practical promise than any of the ages which have preceded it. Of course, I cannot illustrate this at length, but some little attempt at illustration I would fain make.

Let us glance, as it were, at our map. When we generalise very broadly the various causes of death (so far as hitherto intelligible to us) we see them as under two great heads, respectively autopathic and exopathic. On the one hand, there is the *original and inherited* condition under which to every man born there is normally assigned eventual old age and death, so that, sooner or later, he "runs down" like the wound-up watch with its ended chain; and, as morbidities under this type, there are those various original peculiarities of constitution which make certain individual tenures of life shorter than the average, and kill by way of premature old age of the entire body, or (more generally) by quasi-senile failure of particular organs. On the other hand, as a second great mass of death-causing influence, we see the various interferences which come *from outside:* acts of mechanical violence, for instance, and all the many varieties of external morbific influence which can prevent the individual life from completing its normal course. As regards cases of the first class—cases where the original conditions of life and development are such as to involve premature death (which in any such case will commonly show itself as a fault in particular lines of hereditary succession)—the problem for preventive medicine to solve is, by what cross-breeding or other treatment we may convert a short-lived and morbid, into a long-lived and healthy, stock; and this, at least as regards the

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human race, has, I regret to say, hardly yet become a practical question. But, as regards cases of the second class, evidently the various extrinsic interferences which shorten life have to be avoided or resisted, each according to its kind; and here it is that the scientific experimenters of late years have been giving us almost daily increments of knowledge. Two early instances, vastly important in themselves, though of a comparatively crude kind, I have already mentioned; and I now wish to glance at some illustrations of the immense scope and the marvellous exactitude of the newer work.

The invaluable studies of M. Pasteur, beginning in the facts of fermentation and putrefaction, and thence extending to the facts of infectious disease in the animal body, where M. Chauveau's demonstration of the particulate nature of certain contagia came to assist them—they, I say, partly in themselves, and partly in respect of kindred labours which they have excited others to undertake, have introduced us to a new world of strange knowledge. We have learnt, as regards those diseases of the animal body which are due to various kinds of external cause, that probably all the most largely fatal of them (impossible yet to say how many) represent but one single kind of cause, and respectively depend on invasions of the animal body by some rapidly self-multiplying form of alien life. This doctrine, which scientific experiment initiated, has, for the last dozen years, been extending and confirming itself by further experiment. As soon as the doctrine began to seem probable, science saw that, should it prove true, it must have the most important corollaries. If the cause of an infecting human disease is a self-multiplying germ from the outside world, the habits of that living enemy of ours can be studied in its outside relations. It becomes an object of common natural history, it has biological affinities and analogies. We can cultivate it in test-tubes in our laboratories, as the gardener would cultivate a rose or an apple, and we can see what agrees and what disagrees with its life. And then, as the next and immeasurably most important stage, where nothing but experiment on higher living bodies will help us, we can try whether perhaps any of our modifications of the enemy have

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made it of weaker power in relation to the bodies which it invades, or whether, through our more intimate knowledge of its vital affinities, we can artificially give to bodies which it would invade a partial or complete protection against it. Such, at first blush, were the obvious possibilities of research which the new doctrine of infectious disease suggested to the mind of the pathologist; and never since the profession of medicine has existed had a field of such promise been before it. The promise has not been belied. A host of diseases has been worked at in such lines as I just now indicated, and with many of them important progress has been made.

It would be impossible for me even to name a twentieth part of the investigations which have been more or less successful. As regards some which have most struck me, I pass with but a word Dr. Klein's investigation of the pneumo-enteritis of swine; Professor Cohn's and Dr. Koch's and Dr. Buchner's respective contributions to the natural history of the anthrax bacillus; Dr. Bollinger's recognition of the microphytic origin of an important cancroid disease of horned cattle, with Dr. Johne's illustration of the inoculability of this disease; the research by Professors Klebs and Tommasi-Crudeli into the intimate cause of marsh-malaria; and, not least, the demonstration (as it appears to be) which Dr. Grawitz has recently published, that some of the commonest and most innocent of our domestic microphytes can be changed by artificial culture into agents of deadly infectiveness. I pass these and others, in order that I may more particularly speak of some which have already shown themselves practically useful; for in respect of some of them the time has already come when abstract scientific knowledge is passing into preventive and curative act.

First, and not in a spirit of national partiality, I will mention the application which M. Pasteur's doctrine has received at the hands of Mr. Lister, with regard to the antiseptic treatment of wounds: an application which, enforced and illustrated at every turn by Mr. Lister's own eminent skill as an experimentalist, has been confirmation as well as application of the parent doctrine; and the beneficent uses of which, in giving comparative safety to

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the most formidable surgical operations, and in immensely facilitating recovery from the most dangerous forms of local injury, are recognised—I think I may say, by the grateful common consent of our profession in all countries, to be among the highest triumphs of preventive medicine.

Secondly, out of the experimental studies of anthrax—chiefly out of those of Prof. Sanderson and Mr. Duguid in this country, and those of Dr. Buchner in Germany and M. Toussaint in France, has grown a knowledge of various ways in which the contagion of that dreadful disease can be so mitigated that an animal inoculated with it, instead of incurring almost certain death, shall have no serious illness; and the further knowledge has been gained, that the animal submitted to that artificial procedure is thereby more or less secured against subsequent liability to the disease. In other words, with regard to that disease, an infliction which sometimes spreads to man from his domestic animals, and one which in some parts of Europe is of serious consequence to agricultural interests as well as to animal life, the later experimenters—of whom I may particularly name M. Toussaint, and our countryman, Professor Greenfield, seem to be giving to the animal kingdom, and to the farmers, the same sort of boon as that which Jenner gave to mankind when he taught men the use of vaccination. Quite recently, our great leader, M. Pasteur, seems to have made, by new experiments, still further progress in the mitigation of anthrax.

Thirdly, a similar discovery has been made by M. Pasteur, with reference to the contagium of a very fatal poultry-disease, known by the name of fowl's cholera; he has learnt to mitigate that contagium to a degree, in which, if fowls be inoculated with it, they will suffer no serious ailment; and he has found that fowls so inoculated (or, as he, in honour of Jenner, would say, "fowls so vaccinated") are proof against future attacks of the disease.

Fourthly, Professor Semmer, of Dorpat, through experiments done under his direction by Dr. Krajewski, has made a similar discovery in regard of the infection of septicæmia; has found, namely, that by treatment like that with which M. Toussaint mitigates the contagium of splenic fever, he can

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bring the most virulent septic contagium into a state in which it shall be mild enough to serve for harmless inoculations; which inoculations, when performed, shall be protective against future infections.

Finally, in a different direction of experimental work, let me name the recent most admirable research which Dr. Schüller of Greifswald has made, nominally in respect of certain surgical affections of joints, but in reality extending to the inmost pathology and therapeutics of all tubercular and scrofulous affections. A knowledge of the fatal infectiveness of crude tubercular matter had been given (as I before said) by Villemin and those who followed him; and Professor Klebs, four years ago, declared the infective quality to be due to the presence of a microphyte (micrococcus) which he had succeeded in separating from the rest of the matter by successive acts of cultivation in fluids of inorganic origin. Dr. Schüller solidly settles, and widely extends, that teaching. According to his apparently quite unquestionable observations and experiments, the micrococcus which characterizes tubercle characterizes also certain affections popularly called "scrofulous"—namely, "scrofulous" synovial membrane, "scrofulous" lymph glands, and lupus: so that these diseases may be defined as essentially tubercular, and that inoculation with matter from any of them, or with a cultivation-fluid in which the micrococcus from any of them has been cultivated, will infect with general tuberculosis. The rapid multiplication of the tubercle-micrococcus in the blood and tissues of any inoculated animal can be verified both by microscopical observation, and by inoculative experiment; and an extremely interesting part of the research, in explanation of certain of our human joint-diseases, is the demonstration that if in the inoculated animal a joint be experimentally injured, that joint at once becomes a place of preferential resort to the micrococcus which is multiplying in the blood, and becomes consequently a special or exclusive seat of characteristic tubercular changes. Even thus far the practical interest of Dr. Schüller's book is such as it would not be easy to overstate; but still greater interest attaches to the last chapter of the book, in which, confidently resting on the

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pathological facts which I have quoted, he makes proposals for the treatment of tubercle on the basis of its microphytic origin, and shows the successful result of such treatment as he has hitherto tried, from that basis, on animals artificially infected by him.

I venture to say that in the records of human industry it would be impossible to point to work of more promise to the world than these various contributions to the knowledge of disease, and of its cure and prevention; and they are contributions which from the nature of the case have come, and could only have come, from the performance of experiments on living animals.

At this most productive epoch in the growth of medical science, our English studies have been interrupted. An Act of Parliament, passed five years ago under the title of the Cruelty to Animals Act, has made it difficult or impossible for scientific observers any longer to follow in this country any such courses of experiment as those which of late years, at the cost of relatively insignificant quantities of brute suffering, have tended to create an infinity of new resources of relief for the sufferings both of brute and man. The Act does not in express terms interdict all performance of such courses of experiment: it nominally allows them to be done under a variety of limited licenses which may be granted by a Principal Secretary of State; but the limitations under which these licenses are granted, and the trouble, delay, and friction which necessarily to some extent, and in fact often to an intolerable extent, attend the obtaining of any one of them, are practically little better than prohibition.

The Act apparently contemplates, as the chief subjects of its operation, an imaginary class of unqualified persons, who, with no legitimate relation to scientific research, would, under pretence of such research, torture, and (it is supposed) take pleasure in torturing live animals; and against this devilish class of persons the Act is very indulgently framed: for, instead of expressly refusing licenses to unqualified persons, and perhaps hinting to such of them as would do wilful cruelty under pretence of study that the lash and the treadmill are

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for such scoundrels—instead of this, I say, the Act virtually confounds together that supposed class of unqualified and cruel persons, and, on the other hand, our professional class of *bonâ fide* scientific investigators, on whom the progress of medicine depends, and whose names are sufficient security for their conduct. What is counted good for the one class is also counted good for the other. The law will trust no licensed experimenter farther than it can provide for his being minutely watched and regulated by the Secretary of State: and in respect of the details of experimental procedure, the supervision of that high political officer is substituted for the discretion and conscience of the scientific investigator.

Consider for a moment what this means in regard of the members of our profession whom it affects. Contrast with it the almost unbounded trust with which the world, from time immemorial, has regarded the character of our profession. Consider the relations of inmost confidence in which members of our profession in every corner of the kingdom are admitted to share in the sanctities and tendernesses of domestic life. Consider our immense daily responsibilities of human life and death. Consider, for instance, that there is not a member of our profession to whom the law does not allow discretion that, in certain difficulties of child-birth, he shall judge whether he will kill the child to save the mother. And in contrast with all this, is it to be seriously maintained that society cannot trust us with dogs and cats? that our foremost workers—(for it is essentially they who are affected)—cannot be trusted to behave honestly towards their brute fellow-creatures, unless they be regulated and inspected under a special law in much the same prevenient spirit as if they were prostitutes under the Contagious Diseases Act?

I have reason to believe that, if that Act continues on the statute-book, one of two results will follow. Experiments, indispensably necessary for the growth of medical science in relation to the cure and prevention of disease, will cease, or almost cease, to be done in this country; or, as the alternative to this, persons who desire to advance the science of their profession, will be tempted to clandestinely ignore the law,

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and to run their chance, if the worst comes to the worst, of having to try conclusions with the common informer.

Let me illustrate this by two personal references. I have already mentioned Professor Lister, as an experimenter, whose name is now classical wherever science has reached, and whose work has been of signal advantage to mankind. Last autumn Mr. Lister wished to do some experiments in extension of the particular branch of knowledge with which his name is identified, and at a point which he considered of extreme importance in surgical pathology. He found he must either abandon his investigation or must conduct it in a foreign country, and, in his zeal for science, he chose the latter course. His experiments (which had to be on large animals) were done at the Veterinary College of Toulouse; and in stating this fact in a letter, from which I quote, Mr. Lister added that "even with reference to small animals, "the working of the Act is so vexatious as to be practically "prohibitory of experiments by a private practitioner like "myself, unless he chooses to incur the risk of transgressing "the law." A second name which I have mentioned is that of Professor Greenfield, who has so highly distinguished himself in developing, by means of experiments, the preventive medicine of splenic fever. Dr. Greenfield, in order to perform his inoculation-experiments, had, of course, to become a license-holder under the Act; and his experience of the hindrances which attach to that position is expressed to me in the following terms: "It is my deliberate conviction, "as a result of my experience, that these hindrances and "obstacles are so numerous and so great as to constitute a "most serious bar to the investigation of disease, and even "of such remedial measures as would by common consent "be for the direct benefit of the animals experimented upon. "When to this is added all the annoyance and opprobrium "which are the lot of investigators, it is to be wondered at "that anyone should submit to be licensed." Dr. Greenfield's experimental operations consisted only in inoculating the virus of animal diseases, and he says: "I have not been "engaged in other investigations for the simple reason that, "with the present restrictions, and the difficulty of obtaining

" a license, I regard it as almost hopeless to attempt any " useful work of the kind in this country."

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As I feel sure that the Act must at no distant time be reconsidered by the Legislature, and as I also very strongly feel that, quite apart from any question of legal enactments, there is the question of moral right or wrong to be considered in the matter, I would beg you to allow me to make my own public confession of faith (from which I dare say yours will not much differ) in that extremely important matter of controversy.

The question being, whether medical science can rightly use living animals as subjects for experiments which may be painful, and even, in exceptional cases, very painful to them, the answer may be sought in either of two directions: (1) What says the voice of the experimenter's own conscience?—and (2) What says the standard of common contemporary conduct in analogous cases?

As regards the first, if I may take the liberty of expressing my own feeling, I would say this. I do not in any degree regard it as matter of indifference that, in certain cases, by my own hand or by that of some one acting for me, I must inflict death or pain on any living thing. I, on the contrary, think of it with true compunction, but I think of it as good or bad according to the end which it subserves. Where I see my way to acquire, at that painful cost, the kind of exact knowledge which, either in itself or in contribution to our common stock, will promote the cure or prevention of disease in the race to which the animal belongs, or in the animal kingdom generally, or (above all) in the race of man, I no more flinch from what then seems to me a professional duty, though a painful one, than I would, in the days before chloroform, have shrunk from the cries of a child whom I had to cut for stone. If, in a case of the latter sort, the surgeon nerves himself to his work by the conviction of an indispensable usefulness in what he has to do, so does the pathologist in his, and surely in a much larger sense. The agitated parent of the child might sometimes have been tempted to say—" Forbear giving " this cruel pain; let the poor little sufferer die;" but the

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surgeon's reply would have comforted her. And so with the physiological experimenter: except that he, instead of looking at one individual life to be saved, is looking at a race or at many races, and reflects how, in respect of some grievous physical misery, the whole of them, in all their multitudinous successions, may be redeemed through the suffering of the few. This is my personal view of the abstract right or wrong in the question. I state it because, in matters of right or wrong, no man ought to shelter himself behind authority. I believe I may add that if it, or something very like it, had not for centuries been the general view of the medical profession, our professional knowledge would probably be standing in this present age about where it stood in the days of the Plantagenets. Of Harvey and Hunter and Bell, we well know that such was the view on which they acted in rendering their immortal services to mankind; and I am not aware that any man whose opinion really counts in matters of medical science would express any material dissent from it.

The second standard to which I referred was that of the common conduct of men in analogous cases. I pointedly say "analogous," rather than "similar," because common life does not in fact give cases which, properly speaking, are "similar" to ours. But what, I ask, is the common *principle* of behaviour of civilized man to the so-called lower animals? He in every respect subordinates their lives to his own. If he thinks he can get an advantage to himself by killing or painfully mutilating an animal, he does so with apparently no hesitation. See, for one instance, the sexual mutilations which are inflicted on all but a small minority of the males of most kinds of domestic animals, and, as regards some kinds, on many of the females. When I appeared as a witness six years ago before the Royal Commission which was considering the question of our experiments, I particularly endeavoured to draw their attention to this view of the case; and in one of my answers I entered on it more fully than would be suitable to the present occasion. [See, at end of Address, Note B.]

Thus, either way, whether I look to what I may call the general conscience of the medical profession, or look to the principles by which men in general govern their conduct

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towards the brute creation, nowhere do I see fair ground on which exception from outside can be taken to a limited, a strictly economical, use of animal life for purposes of scientific experiment.

No doubt there can be found, outside the medical profession, excellent persons, and plenty of them, whose first inclination would be to dissent from that position of ours ; and some such persons have (as I think, hastily) given public utterance to such first impressions, and done their best to promote legislation against us. Among names which I see identified with opinions different from ours, are some for which I have deep respect. Particularly* of one such man, whom I have the honour to know, I think it may be truly said that his own whole life has been one of practical beneficence, and I would not willingly incur the censure of any such man. But even to him I would fearlessly say, that I think he has not done justice to the case of our profession. To him and such as him, I would confidently appeal to reconsider their first impressions. On him, and such as him, I would urge that the practice of scientific experimentation on living animals is but an infinitesimally small application of the license which common life claims for itself in regard of animals ; and I would challenge such men to examine, with strict impartiality, what are their own responsibilities, direct and indirect, in regard of the infliction of pain on living animals.

I protest against any man's applying to this extremely important question a purely arbitrary standard of right or wrong. Those who pronounce judgment on their neighbours must be prepared to state the principle on which they judge. " Compound for sins you are inclined to, by damning those " you have no mind to," is the Pharisee's easy-going formula. Where would life be, if that were generally accepted ? Suppose a *genus* of action ; let men draw an arbitrary line across it—a line prescribed by no better rule than that which governed the lady's dislike to Dr. Fell ; let them affix a nickname of praise to all on one side of the line, and a nickname of dispraise to

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* The eminent person to whom the speaker alluded was the late (then living) seventh Earl of Shaftesbury.—J.S.

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all on the other: truly we should thus have the readiest of royal roads to unlimited mutual persecution.

And I protest against a standard of right and wrong being fixed for us on grounds which are merely sentimental. In certain circles of society, at the present time, æsthetics count for all in all; and an emotion against what they are pleased to call "vivisection" answers their purpose of the moment as well as any other little emotion. With such sections of society, our profession cannot seriously argue. Our own verb of life is *ἔργαζεσθαι*, not *αἴσθανεσθαι*. We have to think of usefulness to man. And to us, according to our standard of right and wrong, perhaps those lackadaisical æsthetics may seem but a feeble form of sensuality.

Of the mere screamers and agitation-mongers who, happy in their hysterics or their hire, go about day by day calumniating our profession, and trying to stir up against it the prejudices and passions of the ignorant, I have only to express my contempt.

I regret to have had to speak at so much length of the heavy cloud which at present hangs over the study of scientific medicine in England, and which, in my opinion, is likely to be of specially disastrous effect on the progress of preventive medicine. As a very old public servant in that cause, I should indeed grieve to see it brought to a standstill for want of the scientific nurture which, in truth, is its very basis of life: I should be indignant that the Samson, who would yet have fought for our people, had had his eyes thus put out by the Philistines: and I therefore speak publicly of the danger on this occasion, in hope that the occasion may give importance to what I say.

And now, gentlemen, from contemplating that cloud, which happily is but local, and which perhaps may be but temporary, I gladly turn to skies which have no cloud. If there exist in the social organism any function whatsoever for which development and eventual triumph may be foretold, surely it is that of State-Medicine. Of the two great factors concerned in it—the two strong powers which within our own time have

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converged to make it the reality which it is—the growth of science on the one hand, and the growing stress of common humanity on the other, neither one is likely to fail. Of our science it is needless to say that it will grow. To the science of Nature, indeed, is allotted that one incomparable human day which knows no sunset. In the pure light of its ever-present daybreak, individual workers will pass away, generations will change; but the studies of Nature, and, above all, the gathering of such knowledge as can lessen man's physical difficulties and sufferings, will surely grow from age to age, and, as on Proserpina's sacred tree, one golden fruit will follow another: "simili frondescet virga metallo." And no less also in the other direction, the auguries are wholly for our cause. Popular education is gradually making its way, and will grow to be a force on our side. Masses of mankind, that now have to be humbly pleaded for by others, will then be strong to speak for themselves. Physical interests, which now only experts understand, will then be within grasp of all men's apprehension. Not only will health be popularly recognized at its true value, and with knowledge of its elementary requirements, but also the frauds and villanies which are now committed against it will have become intelligible to the common mind; and the workman of the future will strike against being cheated in health as he would now strike against being cheated in wages. As such times come to the world, the Science and the Profession which care for man as man will get to be better appreciated than now. And in proportion as educated nations grow into being true Bodies-Politic, State-Medicine will surely have its due place in their regard, as chief minister to that ideal of government-action which sets its standard of success in the "greatest happiness of the "greatest number."

NOTE A.

The particulars of the experiments mentioned in the Address, as classical in the history of Cholera, were these:—(1) While cholera was invading Europe for the third time, in the years 1853–6, and when it was of immense importance for us all to know whether choleraic discharges are possessed of infective properties communicable to food or drinking water, Prof. Thiersch devised some experiments which he thought might enlighten us. He took mice for the subjects of experiment, and, having disposed them in couples under circumstances otherwise identical, he contrived that each of them should daily swallow with its food a small particle of filtering paper; and for a select number of the couples he provided that the particle of paper swallowed by each mouse should carry with it a minute inoculation of cholera-discharge. Careful experiments with cholera-discharge were thus done on 124 mice, and the results were seen to vary according to the three different states of the discharge. With discharge quite fresh, or with discharge over-stale, the inoculation would produce no ill-effect: nor had any ill-effect been produced on the mice which swallowed the untainted paper; but infection-experiments, done with discharge neither too fresh nor too stale, gave marked results. The mice so inoculated were 56: of these 56 mice, 44 sickened with symptoms of a choleraic sort, and of the 44 which sickened, 14 died. Dr. Thiersch's experiments were accepted, not as exhausting the matter of inquiry, but as very strongly confirming suspicions, which had already been awakened, that cholera (in the human subject) spreads from sick to healthy by means of infectious discharges from the sick. (2) At about the same time with that experimental inquiry by Prof. Thiersch, a retrospective investigation was being conducted in London, as to the influence which had been exerted by the consumption of polluted water in affecting the distribution of cholera in the two epidemics of 1848–9 and 1853–4 among a large population supplied, in two distinguishable quantities, by two water-companies—the Southwark-and-Vauxhall, and the Lambeth. Each of those companies, during the epidemic of 1848–9, and one of them (the Southwark and Vauxhall) during the epidemic of 1853–4, had supplied its customers with sewage-polluted water from the Thames; and the miscellaneous sewage with which the water was polluted had included, of course, choleraic discharges. The statistics of the two outbreaks in relation to the two quantities of local population were, as nearly as could be estimated, these:—The quantity of population supplied by the Southwark and Vauxhall company suffered in the epidemic of 1848–9 at the rate of 118 cholera-deaths for each 10,000 of population, and in the epidemic of 1853–4 at the rate of 130 for each 10,000. The quantity of population supplied by the Lambeth company suffered in the epidemic of 1848–9 at the rate of 125 for each 10,000 of population; but, in the epidemic of 1853–4, only at the rate of 37. And what was the single discoverable difference of condition in favour of the one quantity of population, which suffered comparatively so little when the second epidemic befel? The company which supplied it with water had, in the interval since the first epidemic, improved its supply to comparative excellence; whereas the other company was distributing water of perhaps even filthier quality than before. It was my duty in 1856 to report the results of that inquiry, and one passage of my report may be considered side by side with the record of Dr. Thiersch's "cruelty" to mice:—"An experiment, at which mankind would have shuddered "if its full meaning could have been prefigured to them, has been conducted "during two epidemics of cholera on 500,000 human beings. One-half of this "multitude was doomed in both epidemics to drink the same fecalized water, "and on both occasions to illustrate its fatal results; while another section, "freed in the second epidemic from that influence which had so aggravated the "first, was happily enabled to evince by a double contrast the comparative immu-"nity which a cleanlier beverage could give. By this experiment, it is rendered "in the highest degree probable that, of the 3,476 tenants of the Southwark and "Vauxhall company who died of cholera in 1853–4, two-thirds would have "escaped if their water-supply had been like their neighbours'; and that, of the

" much larger number—tenants of both companies, who died in 1848–9, also " two-thirds would have escaped if the Metropolis Water Act of 1852 [under " the provisions of which the Lambeth company had changed its source of " supply] had but been enacted a few years earlier." Yet—did the thousands of human beings who died under the auspices of commercial experiment add more definitely to our knowledge of the mode of propagation of cholera than did the 14 mice who died under Dr. Thiersch's experiment?

I may add that, in the cholera epidemic of 1866, commerce and science were again contributory from their respective fields of experiment. On the one hand, Dr. Sanderson and Dr. Thudichum (in scientific investigations made for the Lords of the Council) repeated the experiments which Thiersch had made, and they gave valuable corroboration to his results. On the other hand, it having happened that public attention was drawn to an extreme predominance of cholera in the Eastern districts of London—a predominance such that those districts suffered more than two-thirds of all the cholera mortality of London, Mr. J. Netten Radcliffe investigated for the Privy Council the local conditions of that predominance, and the gist of his report was this:—"The sudden and " virtually contemporaneous development of the outbreak over the entire area of " prevalence indicated a medium of propagation common to, and capable of rapid " diffusion over, the whole area; its sudden declension indicated the temporary " efficiency to this end of such a medium. The area of prevalence approximated " with remarkable closeness to a particular field of water-supply; and there are " facts which seem to prove that this approximation was not accidental. It is " known that, immediately prior to the outbreak in the East districts of the " Metropolis and neighbouring districts across the Lea, impure water was distributed over this field of supply, and it is highly probable that this water was " charged with choleraic poison." The water supply to which Mr. Radcliffe referred, was that of the East London company.

Note B.

The terms in which, in my evidence before the Royal Commission of 1875, I commented on certain proposals then before Parliament for a law to restrict physiological experiments were the following:—"I take up, for instance, one of " these Bills, and I find this: 'Whereas it is expedient to prevent cruelty and " 'abuse in the *experiments made on living animals for the purpose of promoting* " '*discoveries in the sciences of medicine, surgery, anatomy, and physiology.*' " Now, suppose this preamble to be before either of the Houses of Parliament " —(I speak of course with great respect to those Houses)—do you suppose " that one of Magendie's experiments, the worst of them, is more cruel to the " sufferer of it than hare-hunting to the individual hare, or fox-hunting to the " individual fox? And is animal life less to be protected against 'cruelty' " when the life is sacrificed for purposes of sport than when it is sacrificed " for purposes of science? You are proposing that physiologists shall be " treated as a dangerous class, that they shall be licensed and regulated like " publicans and prostitutes. What I would venture to put before you is, that " this would be fancy-legislation, touching the relations of man to the lower " animals at a little bit, and a comparatively unimportant little bit, of the " subject matter; and that society would come to such legislation with unclean " hands. Who is the accuser of the physiologists? Society assumes an universal " right to slaughter animals for its food, to cut their throats or wring their necks " at its discretion, and neither stints its luxury (much less its hunger) in reluctance

" to take life, nor troubles itself much about painless methods of killing. To kill
" particular animals in particular ways is a considerable branch of national
" amusement; and the wealthy breed certain animals on a large scale exclu-
" sively to have sport in killing them, and for the unpractised often to mangle where
" they do not kill. Also with a view to slaughter, or with a view to other service,
" society inflicts sexual mutilation on nearly all the males of the cattle, horses,
" sheep, and swine, which it controls; and as to swine, on many of the females.
" You never eat a [male] mutton chop that does not come from an emasculated
" sheep: you rarely use a male horse that has not had its testicles cut out. Now,
" when the common habit of society treats domestic animals in this way,
" slaughtering and mutilating them at its will, for use, for convenience, for
" luxury, and while battues and wager-slaughtering and hare-hunting are
" elements of national sport, it seems altogether monstrous to put into a separate
" category the extremely small use which physiology (for great human interests)
" makes of the lives of brute animals, and to have as the preamble of a Bill that
" cruelty is to be prevented in that one relation, while all the other relations are
" to be left loose."—Evidence, Q. 1491.

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